VOLUME XLV NUMBER TWO

The NATIONAL GEOGRAPHIC MAGAZINE

FEBRUARY, 1924

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SIXTEEN PAGES OF ILLUSTRATIONS IN FULL COLOR

THE HAWAIIAN ISLANDS

America's Strongest Outpost of Defense—
The Volcanic and Floral Wonderland
of the World

With 134 Illustrations GILBERT GROSVENOR

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THE Society is conducting extensive explorations and excavations in northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings and whose customs, ceremonies, and name have been engulfed in an oblivion.

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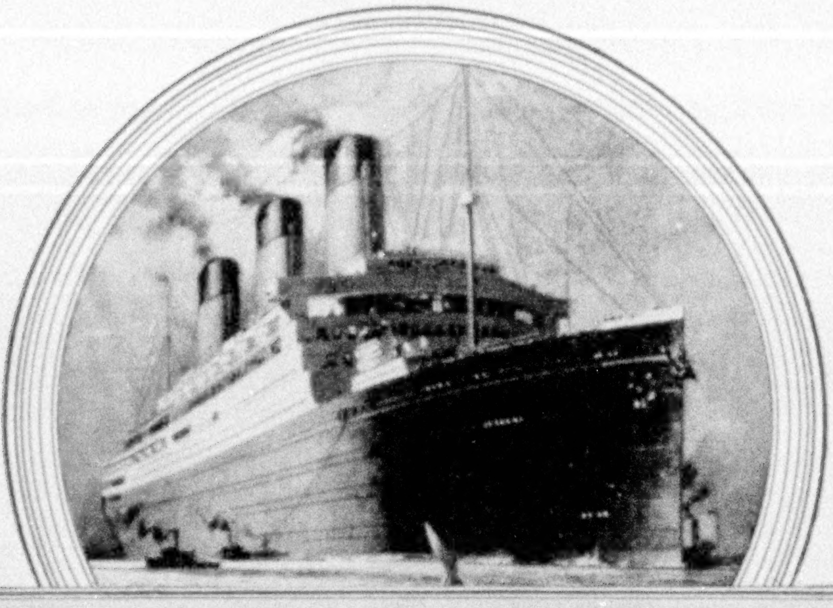

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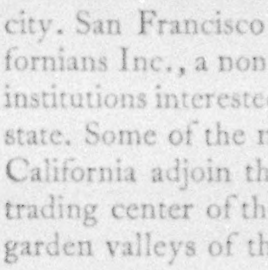

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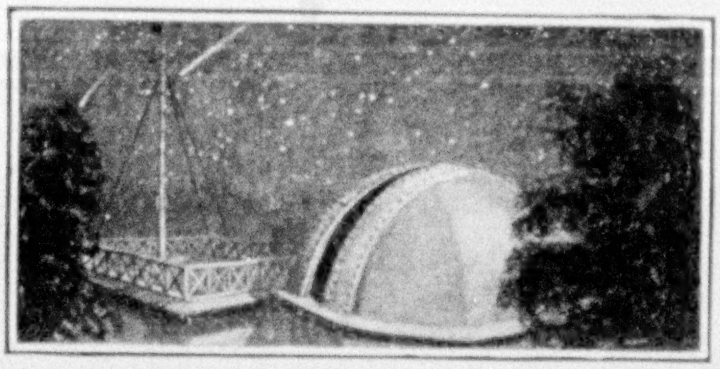

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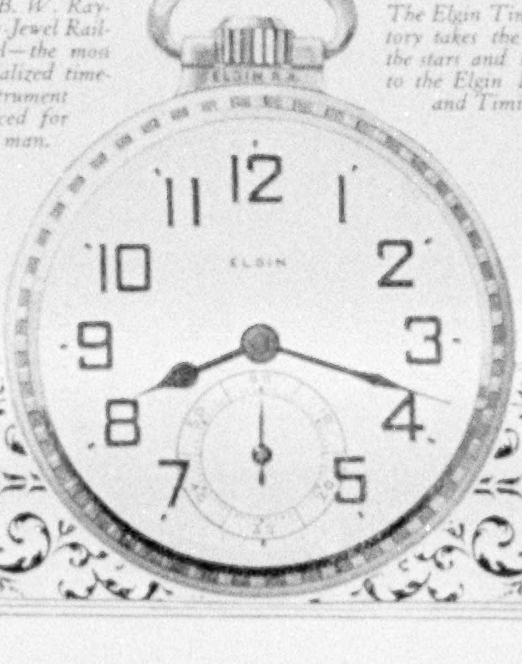

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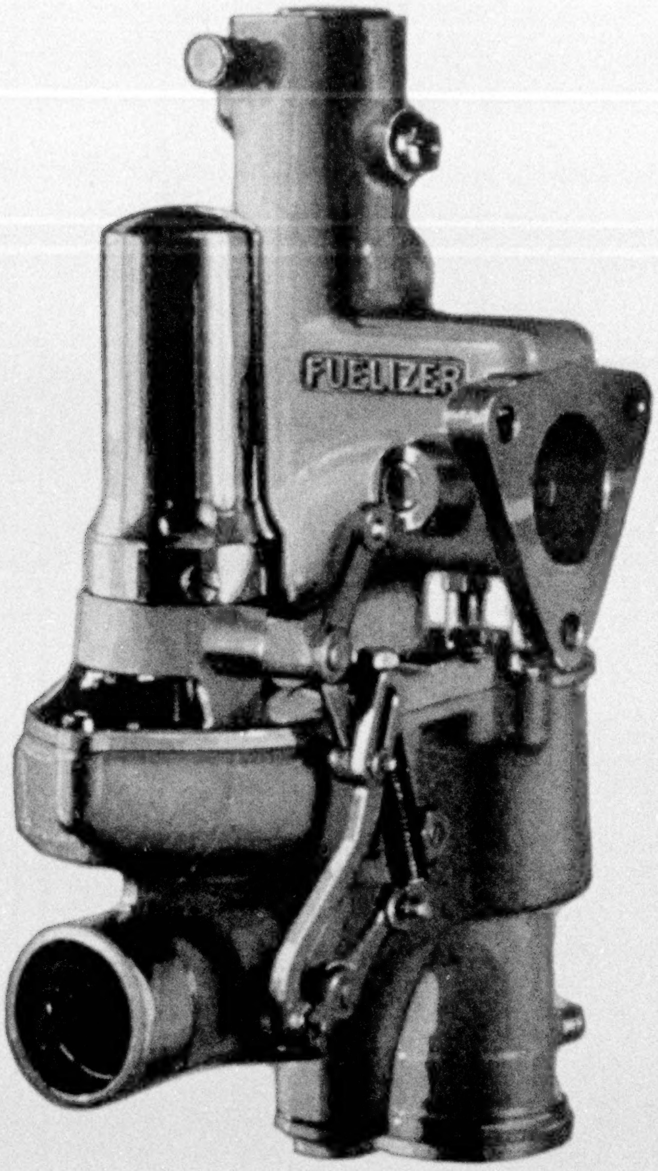

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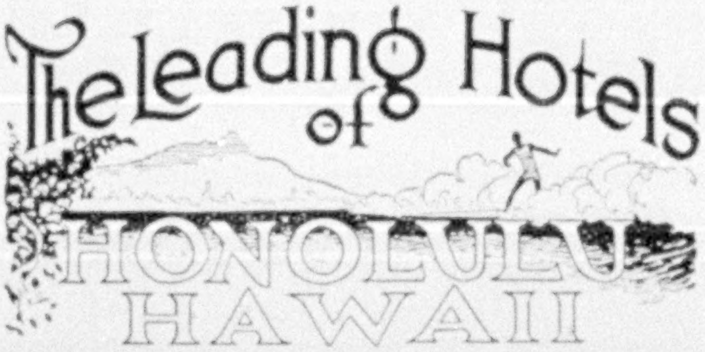

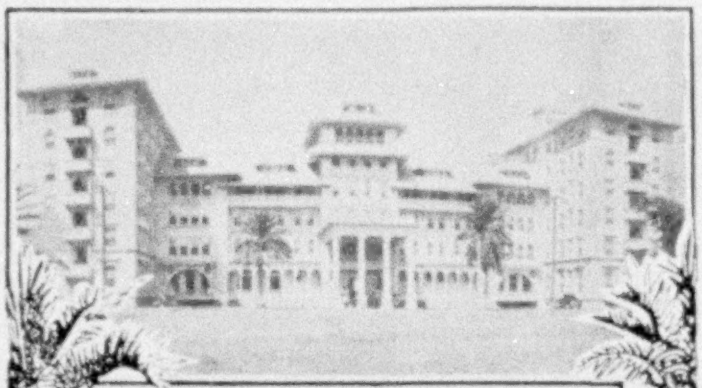

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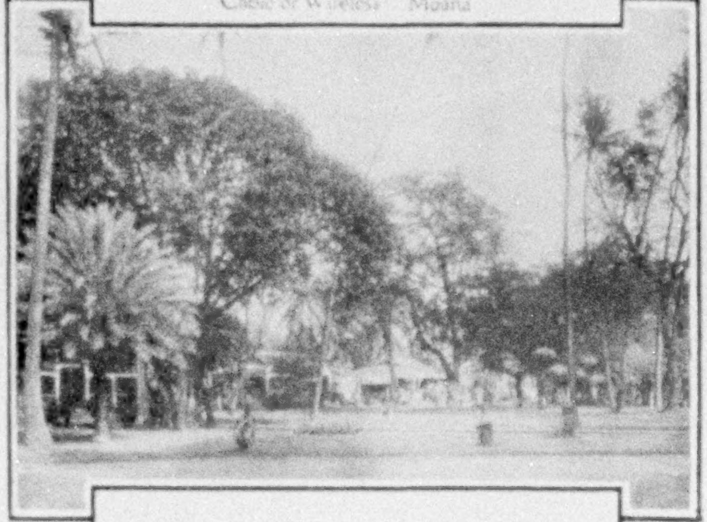

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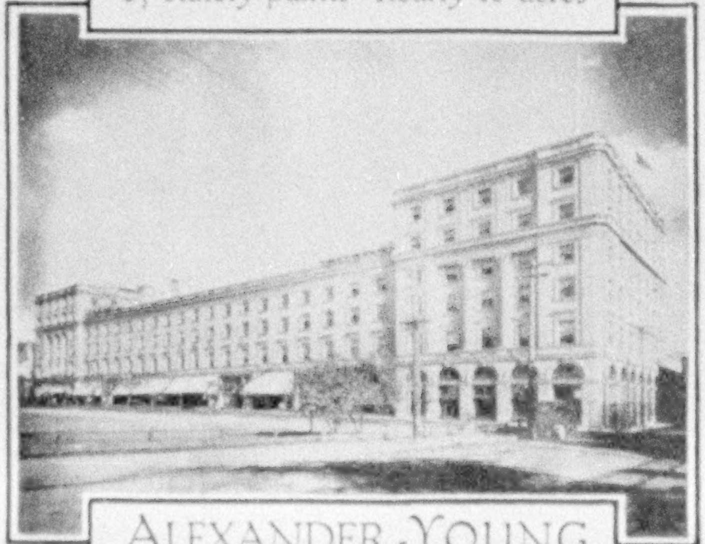

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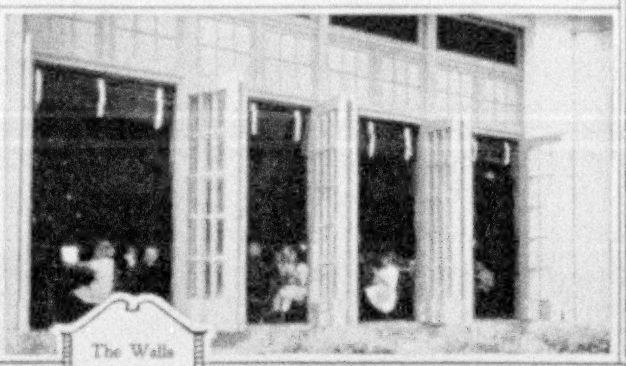

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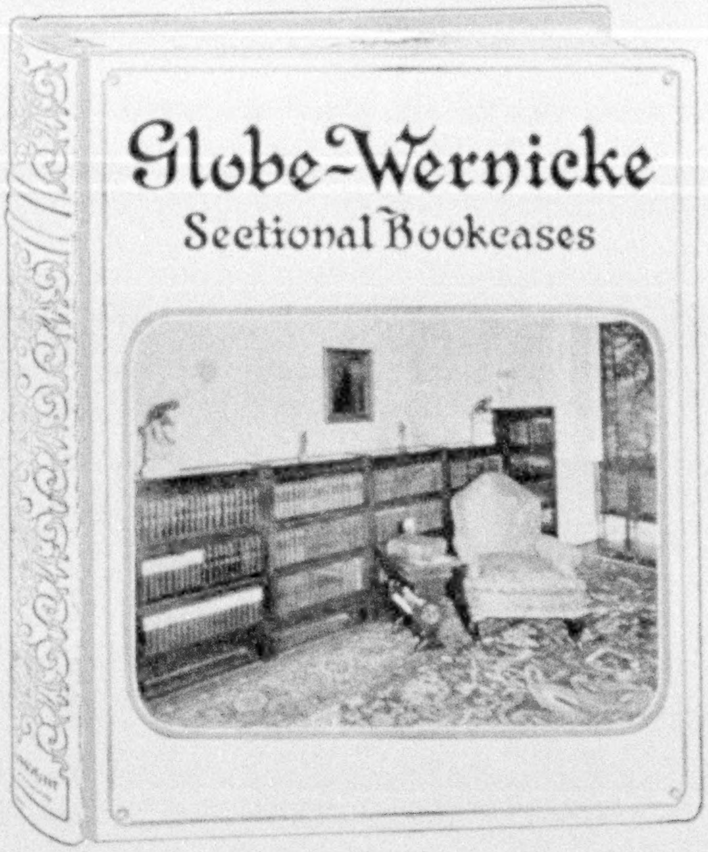

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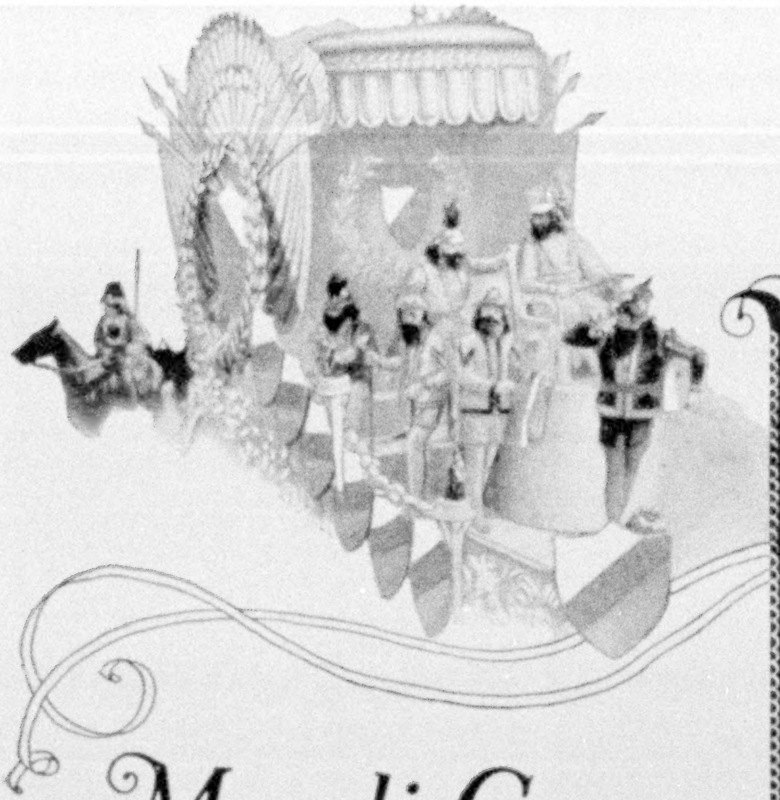

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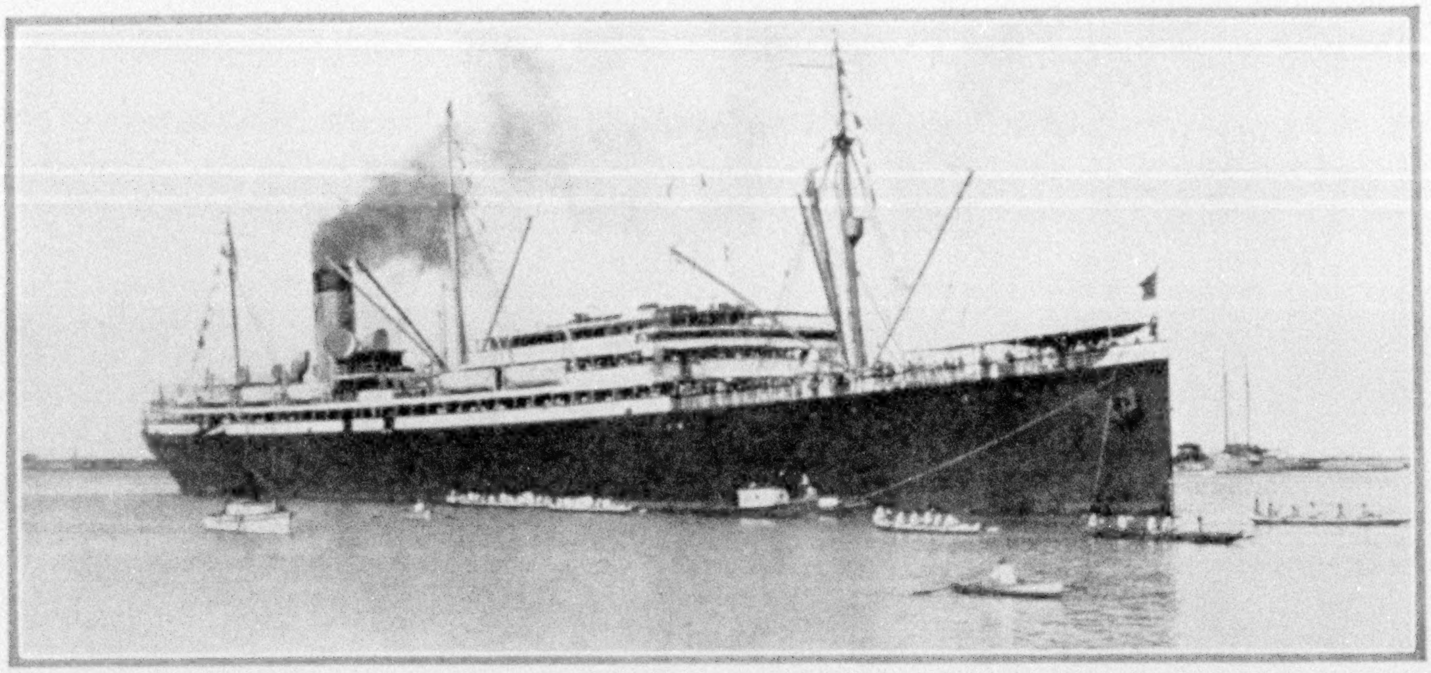

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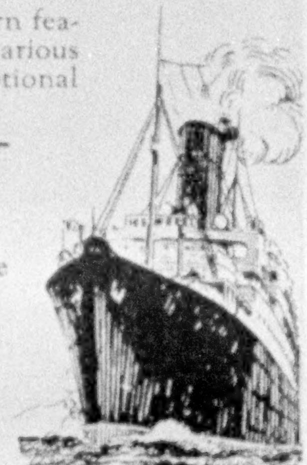

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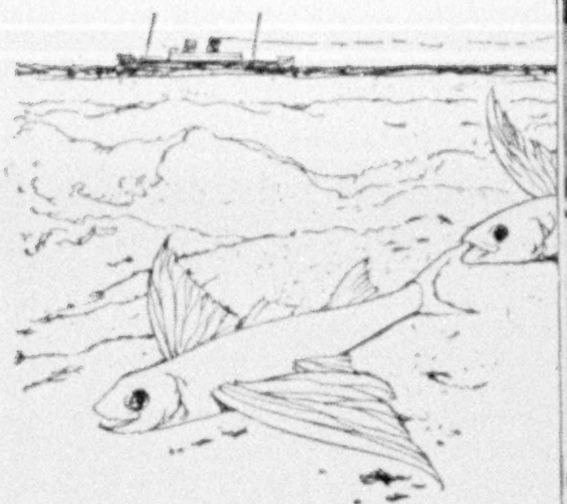

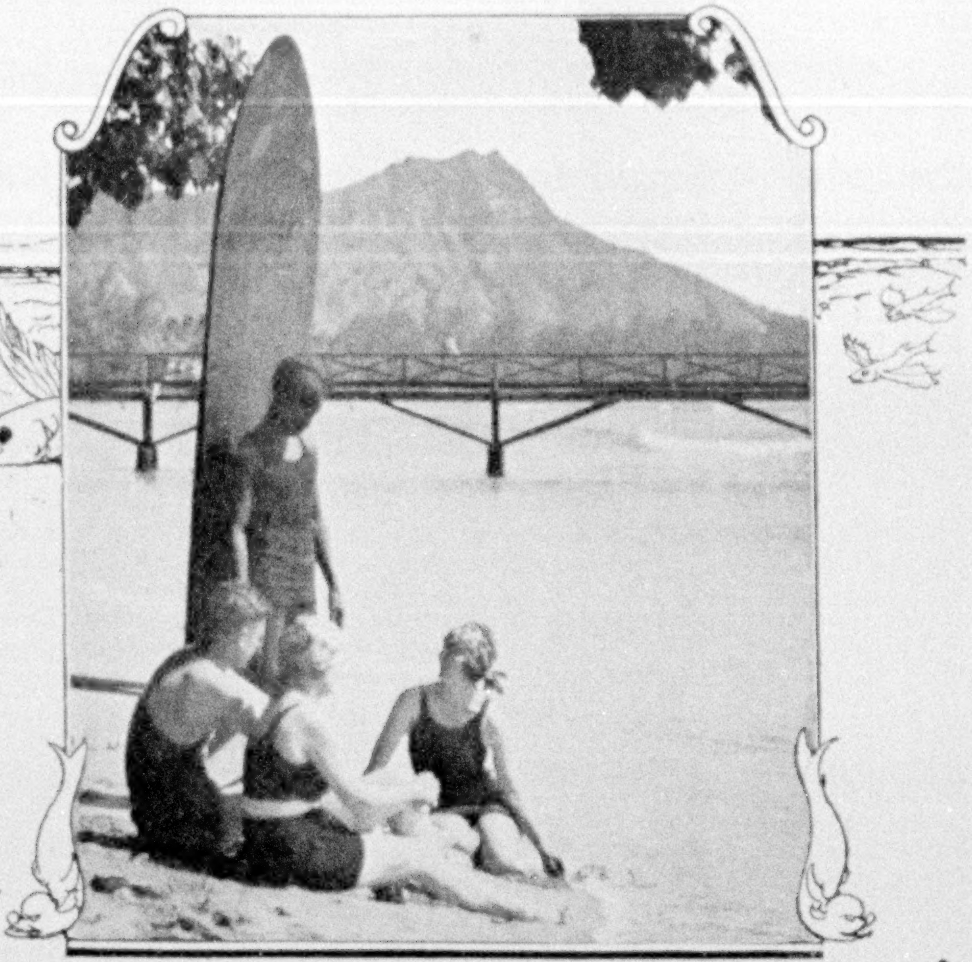

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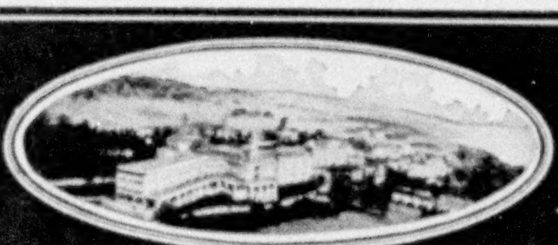

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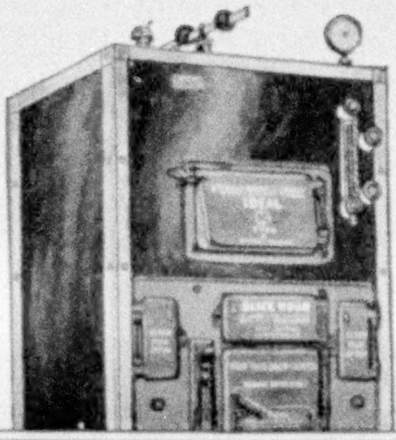

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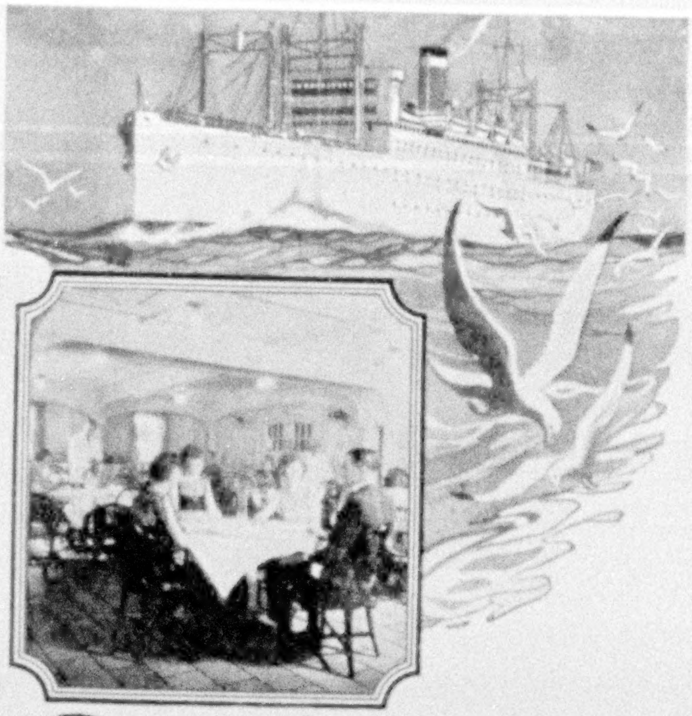

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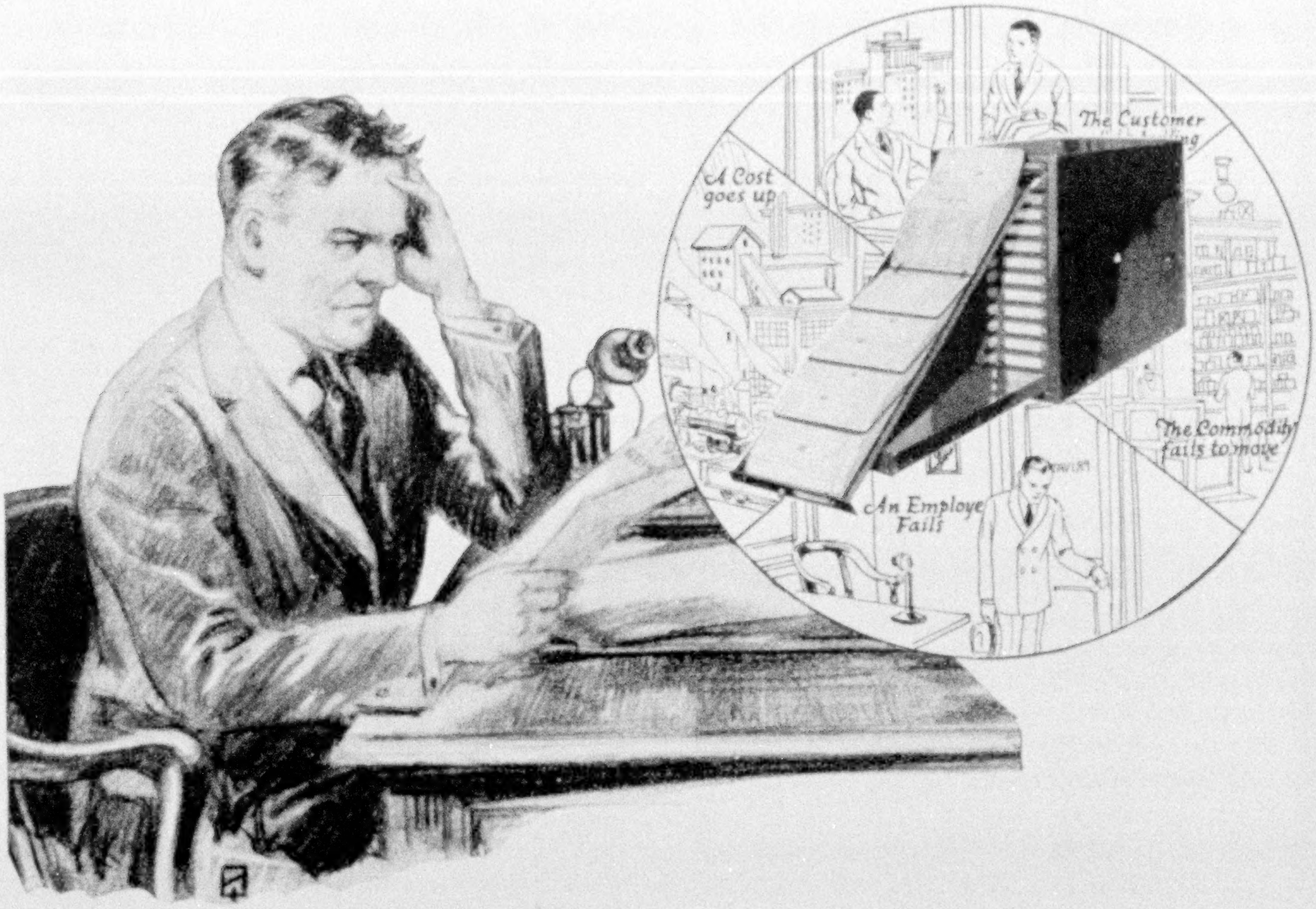

SO LONG as conditions run along normally they do not need your attention, but when the unusual happens

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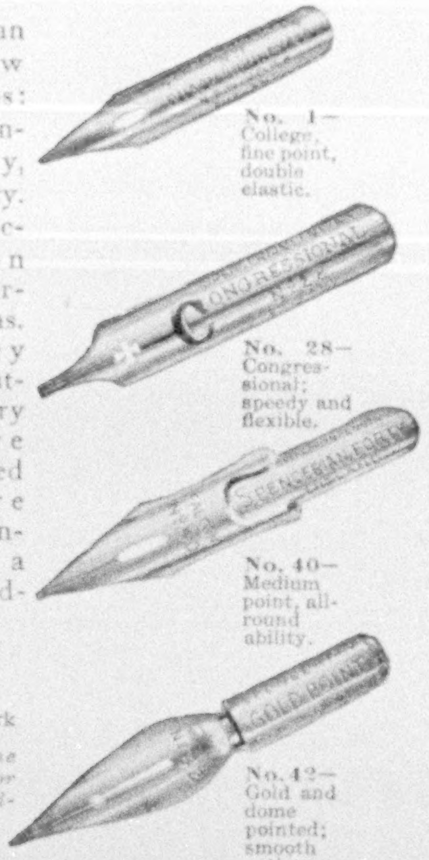

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100 Years to a Day

HOW wonderful it would be if our bodies were like the "one-hoss shay"—if we kept on going until we just collapsed from old age! What joy to live a life free from pain and illness, filled with pleasant activities and followed by a *natural* passing away—just the simple stopping of a worn-out heart!

Heart *disease* is another matter. Today more people die from heart disease than from tuberculosis or cancer or pneumonia. And many of them die needlessly.

Heart disease is not the tragically incurable and unpreventable affliction it was thought to be.

Many damaged hearts can be made to do their work through proper rest and care. The heart has amazing recuperative powers and often will mend itself if given a chance. But even though you have some serious organic heart trouble do not lose hope. A noted heart specialist said: "The cases in which people drop dead from heart disease are comparatively few."

"Have you heard of the wonderful
one-hoss shay,
That was built in such a logical way
It ran a hundred years to a day,
And then, * * * * *

* * * *

* * It went to pieces all at once,—
All at once, and nothing first,—
Just as bubbles do when they burst!"

We are grateful to Mrs. Howard Pyle and Houghton Mifflin Company for permission to reprint Howard Pyle's historic picture of Dr. Oliver Wendell Holmes' wonderful "One-Hoss Shay."

Find out how to live so you will not over-tax your heart. Learn the kind of occupations that are safe for you. Let your doctor tell you what you may do and what you must not do.

A lot of people are suffering from imaginary heart disease. There is scarcely a sensation associated with heart disease which may not be caused by some other disorder. The most important thing is to keep yourself strong and well, so that disease germs will have little chance to attack your body. When you are ill put yourself at once in your doctor's care and obey his orders.

Have your heart carefully examined after every attack of serious illness.

Aim for "A *hundred years to a day.*"

It has been estimated that 2% of the population of the United States, or more than 2,000,000, have organic heart disease. The annual death toll is 150,000.

Prior to 1912 tuberculosis caused more deaths in the United States than any other disease. Since then, heart disease leads.

In the communities where people have learned how to fight tuberculosis, it becomes less of a menace each year.

As fast as people understand what can be done to prevent and relieve heart disease, there will be not only a decrease in the number of deaths, but also a splendid increase in the number of lives completely transformed—from dependence and anxiety to usefulness and happiness.

HALEY FISKE, *President.*

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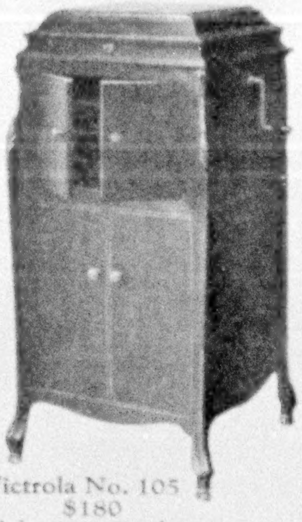
Victor Artist

De Gogorza's voice has endeared him to music-lovers everywhere. Such artistry is sure to be recognized, and it is so perfect on Victor Records that De Gogorza makes Victor Records only. Six of his sixty-nine selections:

	Double-faced	
La Paloma / La Partida	6073	$2.00
O sole mio / Non è ver	6075	2.00
Blue Bells of Scotland / Sally in our Alley	590	1.50



Victrola No. 105
$180
Mahogany or walnut

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SAMAROFF
Victor Artist

The art of Samaroff places her among the greatest of living pianists and her Victor Records possess that quality of tone which is altogether hers. It is in recognition of this fact that Samaroff chose the Victor to reproduce her art. Her Victor repertoire includes:

	Double-faced	
Liebestraum / Nocturne in E Flat	6269	$2.00
Walküre—Ride of the Valkyries / La Campanella	6270	2.00

Victrola No. 260
$150
Mahogany or walnut

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ZIMBALIST
Victor Artist

Zimbalist's fame rests upon his playing—and upon the reproductions of his playing. He is insistent that they shall exactly parallel each other and he finds Victor Records necessary to attain that end. Among his forty-eight numbers are the following:

	Double-faced	
Larghetto / Chant d'Automne	883	$1.50
Russian Dance / Polish Dance (from "Drei Slavische Tänze")	889	1.50

Victrola No. 220
$200
Electric, $240
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Victrola

Look under the lid and on the labels for these Victor trade-marks
Victor Talking Machine Company, Camden, N.J.

VOL. XLV, No. 2 WASHINGTON FEBRUARY, 1924

THE NATIONAL GEOGRAPHIC MAGAZINE

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THE HAWAIIAN ISLANDS

America's Strongest Outpost of Defense—The Volcanic and Floral Wonderland of the World*

BY GILBERT GROSVENOR, LL. D.

President National Geographic Society

AUTHOR OF "THE LAND OF THE BEST," "PEARY'S POLAR EXPLORATIONS IN THE FAR NORTH," "YOUNG RUSSIA, THE LAND OF UNLIMITED POSSIBILITIES," "THE CAPITOL—WONDER BUILDING OF THE WORLD," ETC., ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE

THE Hawaiian Islands, the crossroads of the Pacific, are the most isolated inhabited islands in the world, more than 2,000 miles from their nearest neighbor, California. They have been built along a crack on the ocean bottom by a string of volcanoes, some of which have hoisted themselves seven miles straight up from the ocean floor.

On a map of the Pacific Ocean they look no larger than a pin-prick, probably the reason why some of our friends, not members of the National Geographic Society, asked my wife and myself how we could entertain ourselves for eight weeks in such a small place.

The members of this Society know that the Hawaiian Islands are one of the wonderlands of the globe; that Nature conceals in them more of her mysteries to attract and chain the attention of the student and more of her masterpieces to enrapture the visitor than in any similar area.

Here American ingenuity, courage, and energy have wrought seeming miracles, unsurpassed elsewhere, and achieved discoveries beneficial to all mankind.

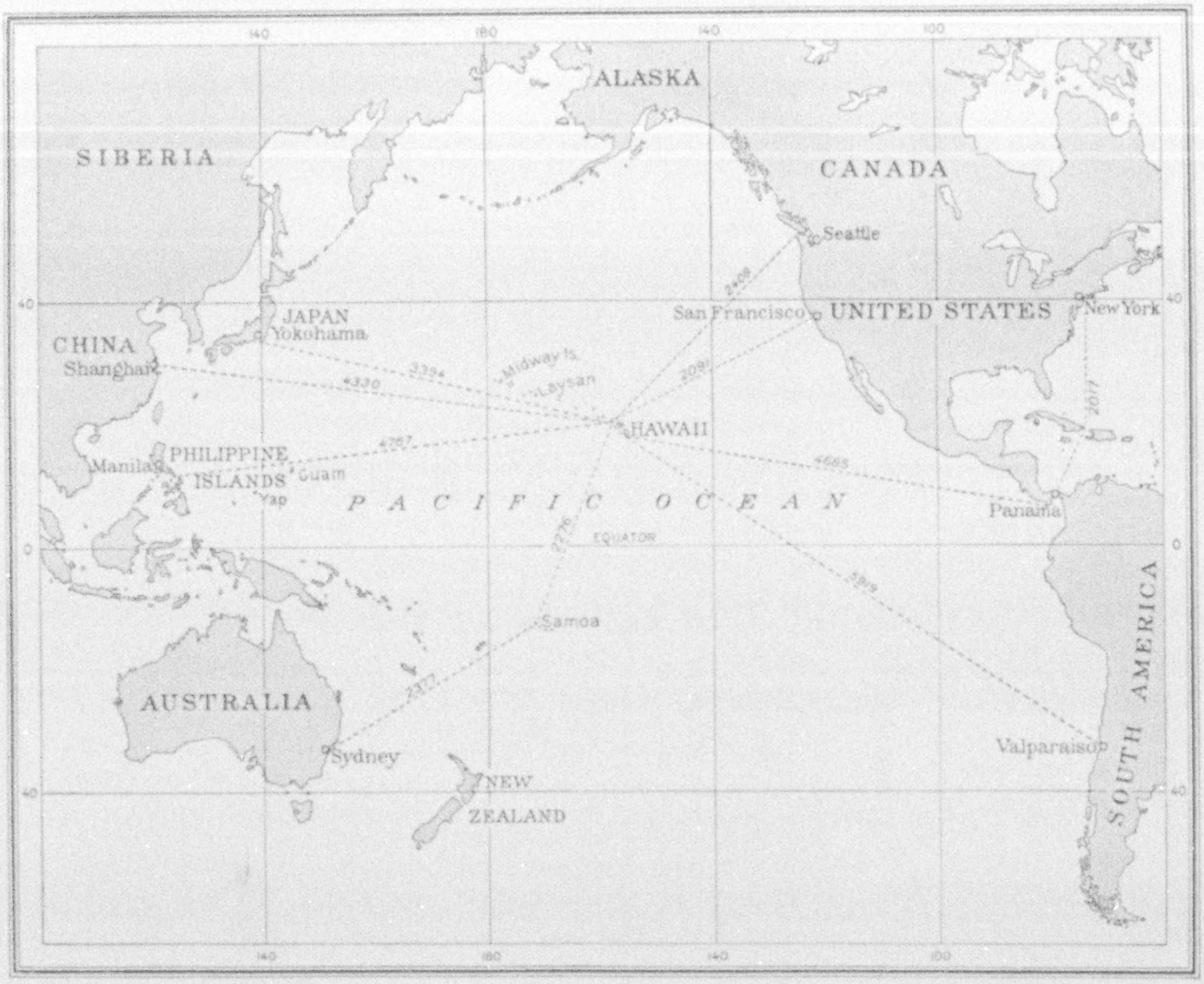
*An address delivered before the National Geographic Society in Washington, D. C.

When discovered, the Islands were already inhabited by a handsome semicivilized race, a happy and kindly people, fond of music and of the beauties of Nature, but subject to a peculiar and harsh form of religion, of which the *tabu* was the principal feature. There were several days in the month, for instance, when no one could stir abroad, could fish or swim, under penalty of death by the king priests.

The tabu was especially severe to the women, who at no time of the year could eat the choicest foods—bananas, coconuts, turtle, etc. No woman could eat in the presence of a man, or in the house in which he ate, or have her food cooked in his oven. Two ovens and two houses to eat in were, therefore, required by every family.

The irreverent will immediately suggest that if Adam and Eve had been Hawaiians, we would have been saved much trouble.

The Hawaiians were sufficiently removed from the Tropics to be compelled to work for a living, and thus became intellectually and physically more alert and vigorous than the islanders of the South Pacific. Life in the sea, from which much of their food was obtained, developed



Drawn by A. H. Bumstead

MAP SHOWING THE STRATEGIC LOCATION OF THE HAWAIIAN ISLANDS AT THE CROSSROADS OF THE PACIFIC

They command every important trade route to China and the Orient across the Pacific.

superb and agile figures, making them the most daring and powerful swimmers in the world.

They had been living on these islands probably for untold centuries before the advent of Cook, in 1778. They had come in canoes hollowed out of single logs by tools cunningly made of rock and hard lava. They had no metals.

Some of the canoes made on the Islands were 70 feet long and could carry 50 or more men. The giant koa trees from which they were fashioned were cut high up on the mountains, painfully and laboriously, with stone axes, and then, with ropes made of vines, dragged shoreward by hundreds of willing hands.

It is believed the Polynesian race, to which the Hawaiians belong, originated in India. Their voyages across the pathless seas rival those of the Vikings. With no compass to assist them and with only the stars and sun to guide them, they broke through the skyline to journey 2,000, 3,000 miles in their frail but unsinkable craft.

PRIMITIVE PEOPLE MADE CLOTH FROM THE BARK OF A BUSH

From the bark of a small bush they made paper cloth, which they ingeniously colored in many attractive designs, using for dyes juices from berries.

A gift of this lovely tapa cloth was the most highly esteemed present. Cook describes receiving a prodigious number of these valuable pieces of tapa from native chiefs. The cloths were delivered in peculiar fashion. Hundreds of yards, representing years of skillful toil, were wrapped round and round a girl's waist, until she staggered under the weight of this present.

They were governed by kings of giant stature, who were absolute and had power of life and death. These rulers were

Photograph by Henry W. Henshaw

SPEARING TURTLE, HAWAII

believed equal to the gods, and the common people were made to lie on the ground when the king came forth. Color Plate I pictures a king clad in feather robes, with feather helmet and *puttees of sharks' teeth.*

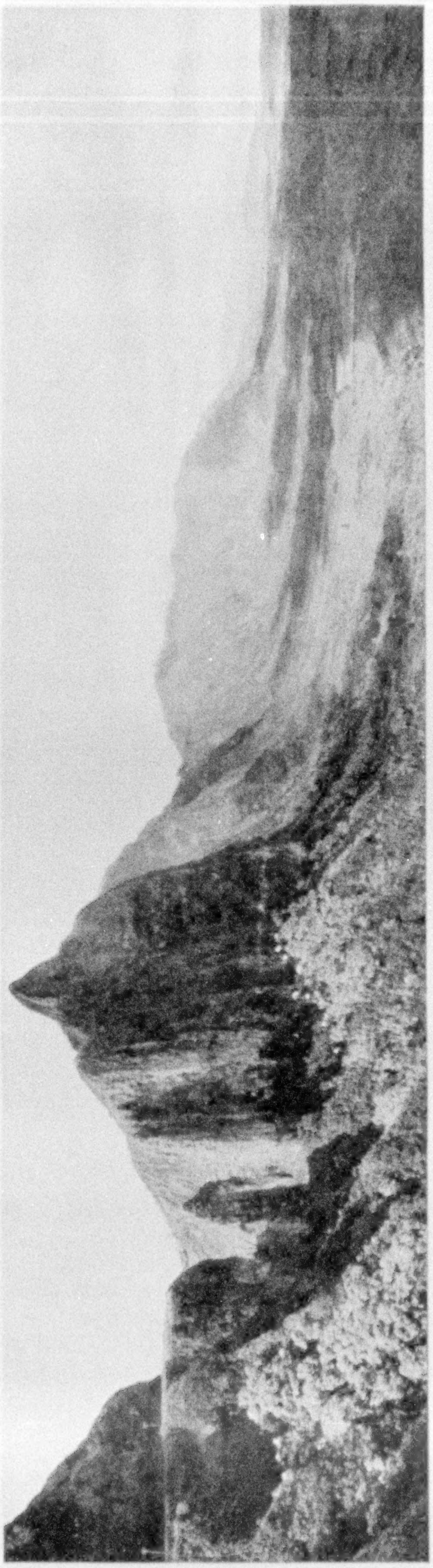
One of these royal feather cloaks now in the Bishop Museum at Honolulu is valued at one million dollars; 100 years were required to make it, as only the feathers of a rare bird, the mamo, could be used. These feathers are almost as delicate and slender as the hair from the human head.

Only a single feather under each wing of the mamo possessed the requisite color, texture, and length for the royal cloak. The birds were caught by a glue spread on trees, and after the two feathers were removed from the captive—one from each wing—it was set at liberty to raise another crop of feathers.

So irregular were marital relations that the Hawaiian language at the time of the arrival of white men contained no word for "father." So even was the climate throughout the year that there was no expression for our word "weather."

When Cook landed, in 1778, he was greeted as the God Lono, who the Hawaiians had been taught by their priests would arrive on a floating island; he was given quarters on a temple at Napoopoo and worshiped as a deity. But his men were overbearing and ruthless, and when they needed wood removed the sacred fences around the temple and even the sacred images.

When one of Cook's men died, the white men were recognized as mortal and the halo that surrounded them vanished. Cook was killed in a fight, his flesh stripped from the bones and fed to dogs,



Photograph by E. A. Wolff

THE VIEW FROM THE NUUANU PALI, ABOVE HONOLULU (SEE PAGE 140)

Through the break in the ridge on the left, which marks the Nuuanu Pali, the northeast trade rushes with such violence day after day throughout the year that often the observer cannot stand against it.

and his heart preserved and hung to the rafters of a hut, where it was found by some boys, mistaken for the heart of a pig, and also eaten.

TABLE MANNERS OF THE EARLY HAWAIIANS

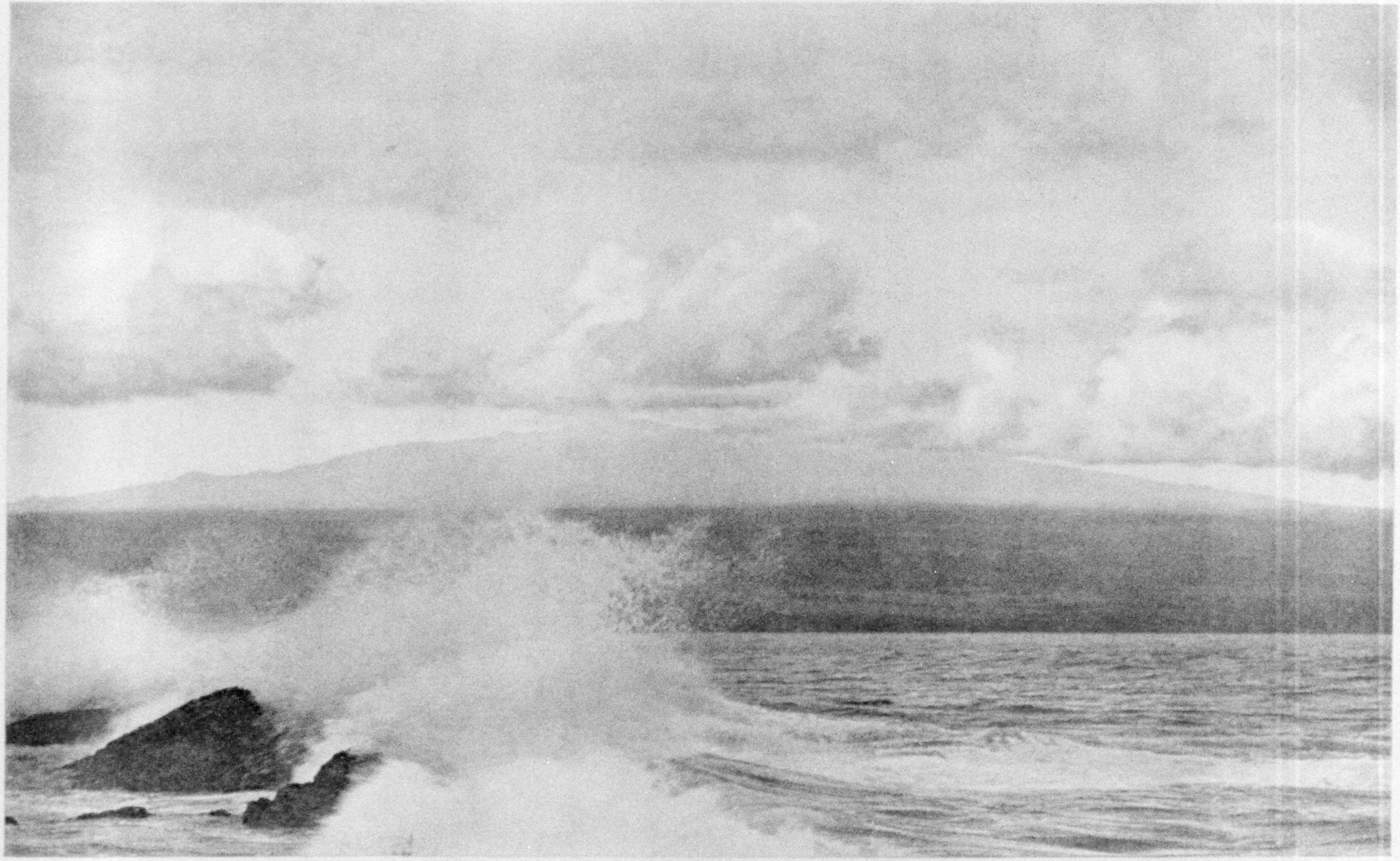
"Their ceremony of eating," writes Albert P. Taylor, in his charming and authoritative narrative, "Under Hawaiian Skies," "was far superior to that prevailing in the baronial halls of Europe, where gluttony and lack of niceties in the partaking of food were in contrast to the delicacy of methods prevailing at the fern-covered tables of the chiefs under Hawaiian skies. Trunks of trees fashioned into bowls beautifully polished, and other bowls of varying sizes and designs, furnished the table.

"There were large, round bowls for poi, long, concave trenches for roasted pig; wide, flat ones for fish; small calabashes and gourds for relishes and desserts; large ones filled with water, with fern leaves floating upon the surface, for use as finger bowls—providing the ancient Hawaiian with dishes that, in a measure, are as beautiful as the chinaware which graces our modern, civilized tables.

"There was no hasty use of both hands over a fish, or fowl, or pig. Reclining upon one elbow, even as epicurean Romans and Greeks of old reclined, the chief used the fingers of the other hand to separate the flesh before him, and each morsel was conveyed to the lips with as much delicacy and grace of movement as possible, and the finger bowls were frequently used. Can we say as much for the Europeans of the Dark Ages?

"So closely allied were the ceremonies of the Hawaiian priests to those of the Jews of ancient Palestine—even to the manner of constructing their temples—that there is cause to wonder at such superior civilization.

"The Hawaiians had their Temples of Refuge, into which the pursued from justice, malefactors, and innocently accused persons, could seek



Photograph by Henry W. Henshaw

ONE OF THE WORLD'S HIGHEST ISLAND PEAKS, MAUNA KEA, 13,823 FEET, ON THE ISLAND OF HAWAII

The great cones of Hawaii rise from the shore in such long, easy slopes and are of such enormous bulk that their great height is not apparent from the sea.

Photograph by Henry W. Henshaw

AN OLD-TIME GRASS HOUSE IN HAWAII, 1890

The only grass house to be found in the Islands to-day is carefully preserved in the Bishop Museum, and the only hula-hula girls to be seen are those in burlesque shows.

and receive shelter and respite from injury until the temple authorities could determine their guilt or innocence.

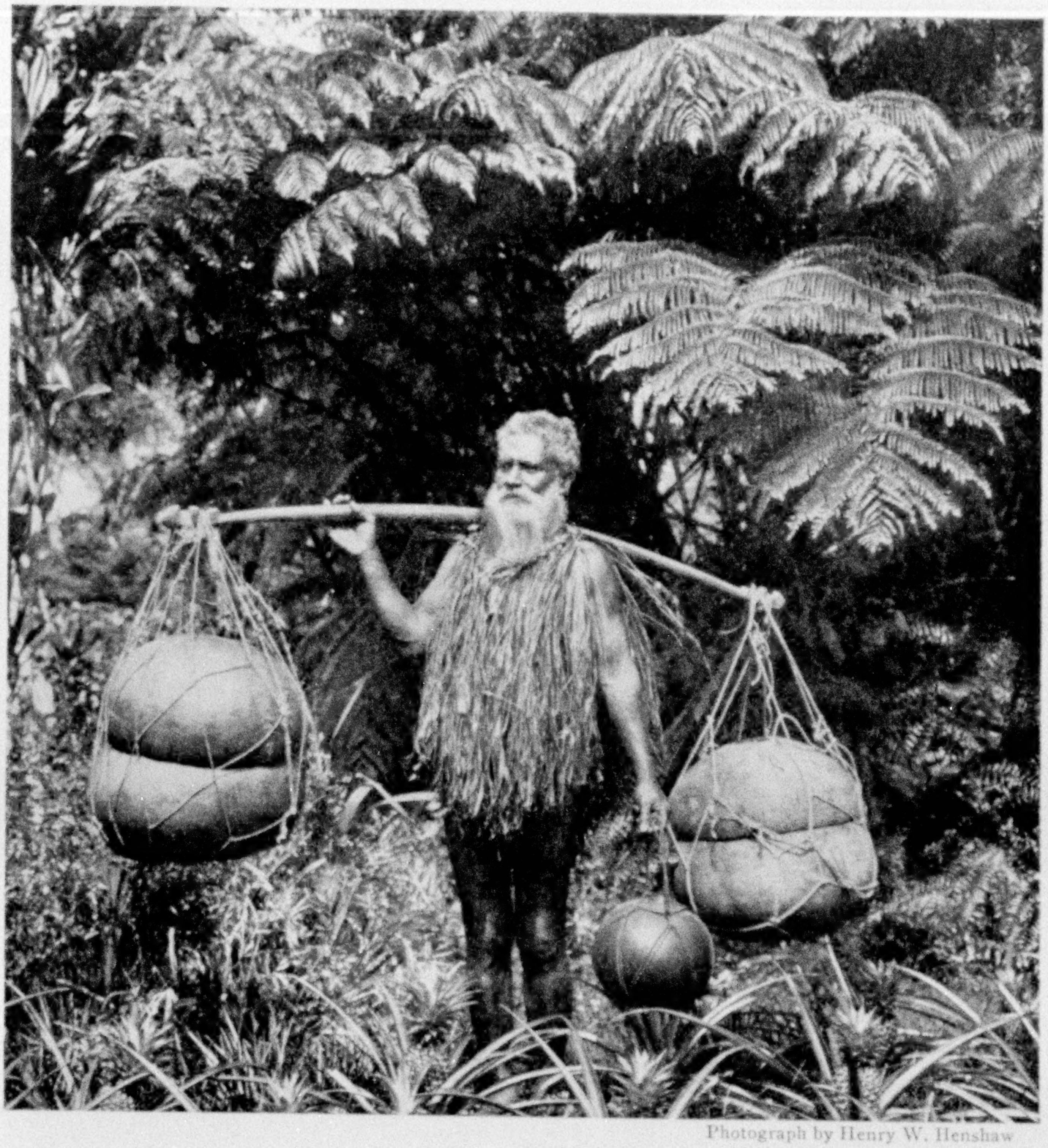
"They had their purification of the temples with salt, similar to the ceremony in Palestine. They performed the ceremony of the circumcision as it was performed in the Holy Land. They had their ashes and sackcloth. The priesthood was related to the government and to the direction of the habits of the rulers as the priesthood was related to the rulers in Palestine."

American interest in the Hawaiian Islands really begins with the sailing from Boston of the first small company of missionaries in the fall of 1819.

NEW ENGLAND MISSIONARIES KINDLED AMERICAN INTEREST IN THE ISLANDS

In altruism and religious fervor, that little missionary band which embarked on the *Thaddeus* October 23 resembled the group of the Pilgrim Fathers on the *Mayflower;* the latter were sacrificing all to seek in a distant land religious freedom for themselves, the former were sacrificing everything to take religious liberty and light as they conceived it, to others.

Probably no page in American history



Photograph by Henry W. Henshaw

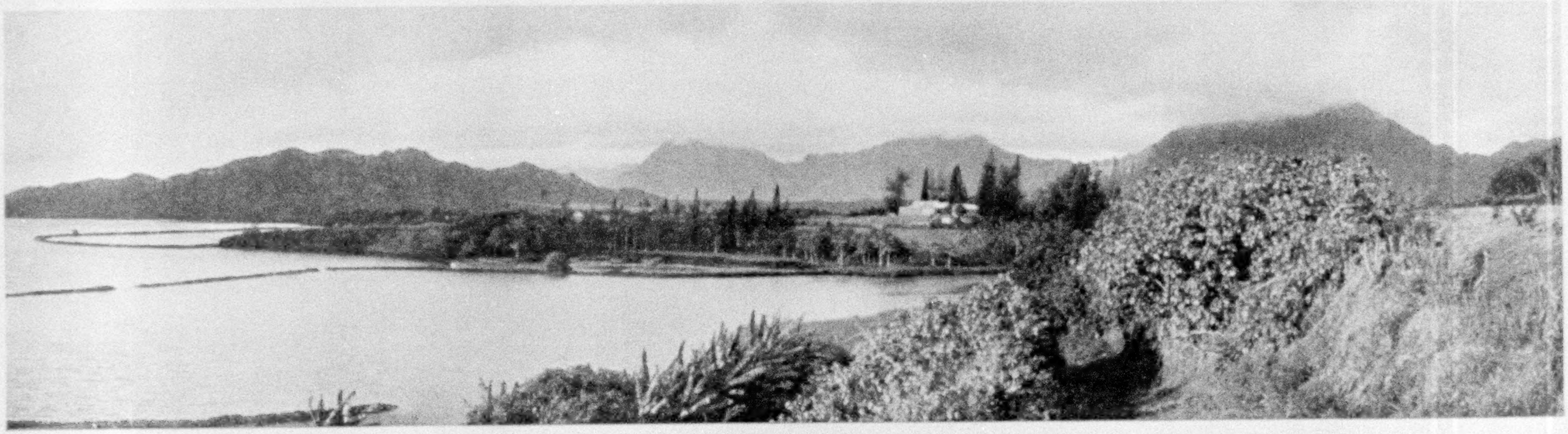
A CALABASH CARRIER IN ANCIENT HAWAIIAN DRESS IN THE FERN FOREST

The most valuable of their household utensils was the calabash. It was fashioned from wood or made from the shell of the gourd. The Hawaiian people knew nothing of the potter's art. In the carving of these wooden bowls with stone tools much skill was exhibited. Some of them are thirty inches in diameter, and are among the most remarkable objects wrought by the ancient Hawaiians.

is more stirring and romantic than the adventure on which those young men and women of New England embarked. It has been told many, many times; but, like the stories of the Old and New Testament, and of the founders and saviors of our country, it gains in interest and wonder with each new telling.

Some Hawaiian boys had been brought to New England by American whalers. Their stories of the godlessness of their native islands so aroused the sympathy of the churches, which were already in a ferment of enthusiasm for that new "fad," foreign missionary enterprises, that some good people at once organized to send missionaries to Hawaii, then called the Sandwich Islands.

Revival meetings were held throughout the colleges, and volunteers called for. Many offered their services, but only few could be chosen, and these were young

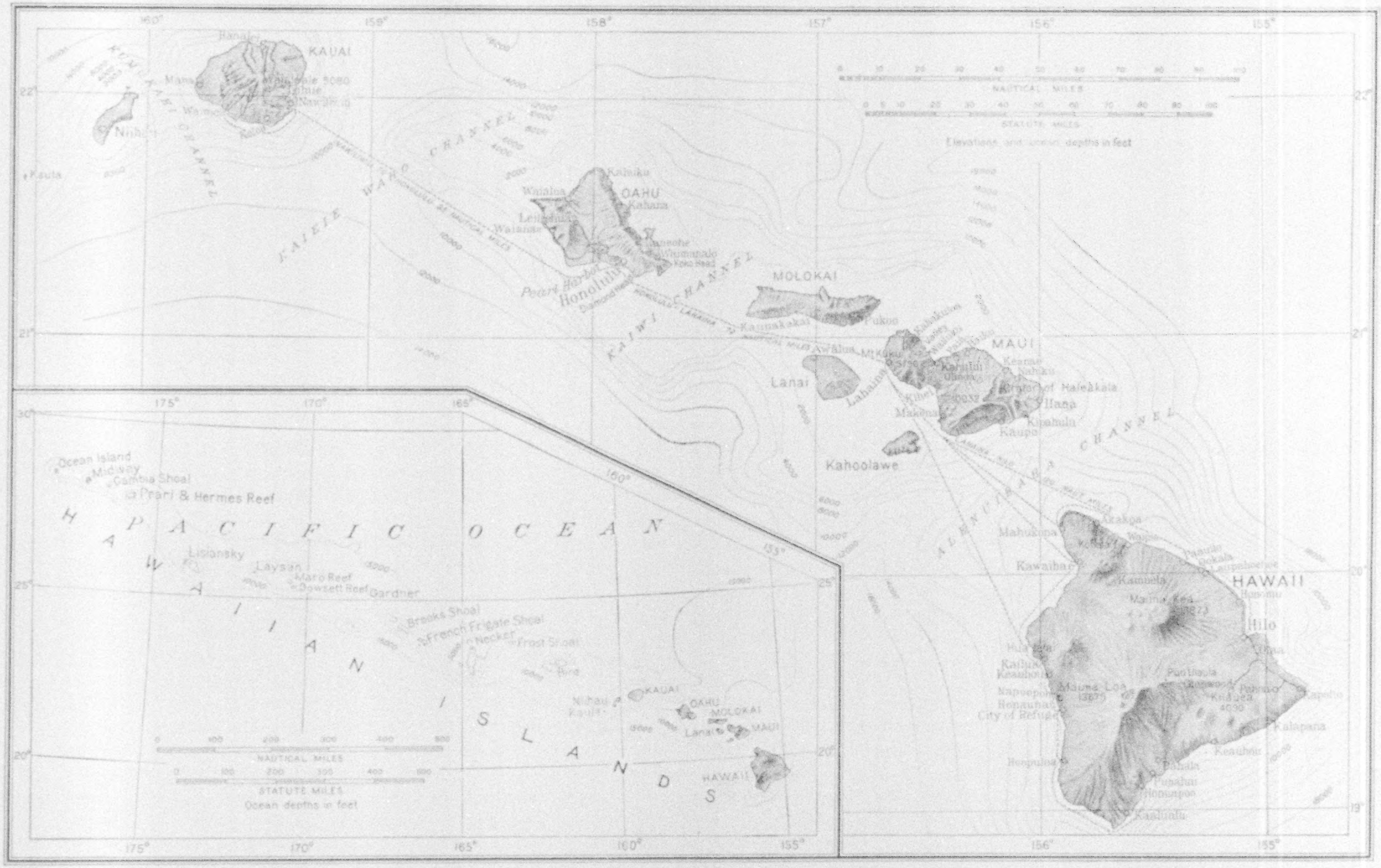


ROYAL FISH POND AT KANEOHE, OAHU

By compulsion of the Hawaiian kings long before the arrival of Cook, the natives, with incredible labor, had built sea walls (see page 146) to enclose arms of the sea, thus making excellent ponds in which to keep and propagate fish for the royal table.

Photographs by R. W. Perkins

ROYAL FISH POND AT HEEIA, OAHU



Drawn by A. H. Bumstead

MAP OF THE HAWAIIAN ISLANDS

The Territory of Hawaii includes innumerable islands, extending from Hawaii on the southeast to Ocean Island, nearly 1,500 miles to the northwest. Large commodious steamers ply regularly between the four principal islands of the group, so that the visitor can move comfortably from island to island, taking his flivver or big limousine with him if he chooses. Oahu, Maui, Kauai, and Hawaii maintain a splendid system of highways. In a remote geological era, the islands from Kauai to Hawaii probably formed one single island. For detailed maps of Oahu, see page 134; Maui, page 145, and Hawaii, page 183.

men picked for their excellence in virtue, industry, intelligence, and education.

Most of these young men were unmarried and must need be provided with wives. So volunteers were called for from among the young women, and they, too, were subjected to rigid tests of their piety and womanly virtues. Among the chosen was Lucy Goodell, teacher, from whose diary I quote:*

"*Marlboro (Mass.), West Parish,*
"*Saturday, Sept. 18.*

"Yesterday, during my noontide intermission, I received, at my boarding house, an unexpected call from cousin Wm. Goodell. He gave me information that a mission to the Sandwich Islands was to sail in four or six weeks, dwelt upon it with interest and feeling, and notwithstanding his efforts to assume his usual cheerfulness, now and then I saw the tear start in his eye.

"His conversation and appearance made me tremble.

"At length, having prepared my mind, the proposition was made: 'Will Lucy, by becoming connected with a missionary now an entire stranger, attach herself to this little band of pilgrims and visit the far-distant land of Obookiah?' . . .

"The gentleman proposed as the companion of my life is Mr. Thurston, member of the senior class in Andover Theological Institution. He had recently become an accepted missionary of the American Board of Commissioners for Foreign Missions, soon to sail for the Sandwich Islands. This has all come suddenly upon him. Now that he knows the situation he is called to fill, he has no personal knowledge of one who is both willing and qualified to go with him to a foreign land. . . .

"What could I say? We thoroughly discussed the subject, after which I gave permission for a visit. Next week, on Thursday, is the anticipated, dreaded interview of final decision. Cousin William walked with me and, as we approached the schoolhouse, bade me good-by. I immediately entered the school, but how I longed to find my chamber, that I might give vent to the feeling of an almost bursting heart. Last night I could neither eat nor close my eyes in sleep.

"*Sept. 21, Tuesday.*—The subject has been to my mind utterly overwhelming, and I all alone during this season of conflict. Situated six miles from my father's, I have no confidential friend near me to whom I can unfold my feelings.

"William Goodell fully informed my family that the waters were troubled. During the week my two sisters from home, Eliza and Meliscent, called on and comforted me with their sympathy and affection. I have received, too, communications from my father. But they all leave me to myself, to act agreeably to my own judgment and inclination.

"Dear to my heart are my friends and country! Yet, all this side the grave, how transient! The poor heathen possess immortal natures and are perishing. Who will give them the Bible and tell them of a Savior?

"Great as must be the sacrifices, trials, hardships, and dangers of such an undertaking, I said, 'If God will grant His grace and afford an acceptable opportunity, Lucy and all that is hers shall be given to the noble enterprise of carrying light to the poor benighted countrymen of Obookiah.' After this decision, I could contemplate the subject with a tranquil mind and unmoved feelings.

"*Home, Sept. 22, Wednesday.*—This afternoon I returned to the paternal abode. I have, with the most perfect freedom, conversed with my family here on the subject. They left me alone to breast the billow. But when I came among them with composure and serenity, buoyed up by a noble purpose, they gave me their full sympathy and approbation.

"*Sept. 23, Thursday.*—The close of this day brought our expected Andover friends, William Goodell and Mr. Thurston, to our door and established them in our parlor. That was a strictly private family interview. I returned home and alone entered the house the night before. Our dwelling was completely isolated from neighbors, and not a word had been dropped of expected company.

"We were alone in our little world. There were my father and my two brothers and their wives, all belonging to the house. . . .

"The early hours of the evening were devoted to refreshments, to free family

* "Life of Lucy G. Thurston."

sociality, to singing, and to evening worship. Then one by one the family dispersed, leaving two of similar aspirations, introduced at sunset as strangers, to separate at midnight as interested friends.

"*Sept. 24. Friday.*—In the forenoon, the sun had risen high in the heavens, when it looked down upon two of the children of earth giving themselves wholly to their Heavenly Father, receiving each other from His hand as His good gift, pledging themselves to each other as close companions in the race of life, consecrating themselves and their all to a life work among the heathen."

Photograph by Henry W. Henshaw

A PURE-BLOODED HAWAIIAN GIRL WEARING THE COSTUME OF PAST GENERATIONS

THE FIRST COMPANY SAILS FOR HAWAII

Four weeks later Lucy Goodell, as the wife of the Rev. Asa Thurston, sailed for Hawaii in the First Company, which included, besides her husband and herself, several other young couples, the Rev. and Mrs. Hiram Bingham, Dr. and Mrs. Holman, Mr. and Mrs. Whitney, Mr. and Mrs. Ruggles, Mr. and Mrs. Loomis, and Mr. and Mrs. Chamberlain and their five little children.

The Hawaiian Islands are very near to us now. The printers' ink will hardly dry on these pages before the daylight flight from Honolulu to San Francisco will be achieved, and we are already speculating on how soon the tourist will go from Boston to Hawaii in three days by air transit.

But so distant were the Islands from Boston in 1819 that not until seventeen months after the *Thaddeus* sailed was intelligence received in Massachusetts of the safe arrival of the party at its destination.

The young missioners were agreeably surprised when they landed in Hawaii. They had had no prevision of the equable and healthful climate which they would discover, nor of the pleasant and sympathetic greeting which they would receive from the hospitable natives.

Nor had they been advised that a few months previous to their embarkation from Boston Kamehameha the Great had died, and that his favorite widow had induced the people to shatter the old practices of tabu and idolatry, and had further influenced the new king to eat in company with women for the first time.

The Hawaiians, having discarded their old rites as barbaric, were agreeable and receptive to new teachings. To win their confidence and support, all that was required from the youthful company from Boston was tact and evidences of character and sincerity, all of which they had in abundance.

Photograph by Gilbert Grosvenor

A BIRD'S-NEST FERN

There are forty species of this genus in Hawaii. They are common in the trunks and forks of trees in the forests, and in the cities are much cultivated. Some specimens have leaves 4 feet long and 8 inches wide. Here a small specimen is seen immediately below the larger "nest."

Recalling those days many years later, Mrs. Thurston wrote: "In 1820 the first foreign ladies reached these shores that were ever seen by the eyes of natives. They were seven in number, including one mother with five children. That company had only liberty to come on shore and stay one year. What circumspection, what power of endurance they were called upon to exercise!

FIRST WHITE WOMEN AND CHILDREN WERE RARE CURIOSITY

"The ladies were a rare curiosity to the nation; the children more so. To turn from scenes of pressing their own children beneath the sod with their own heels, or, if allowed to live, to go entirely naked; then to behold our children dressed with shirts, pants and coats, with dresses and neck-attire, with stockings and shoes, with hats and bonnets, they were delighted, they were fascinated with them, as much as our children would be with a fresh importation of London dolls.

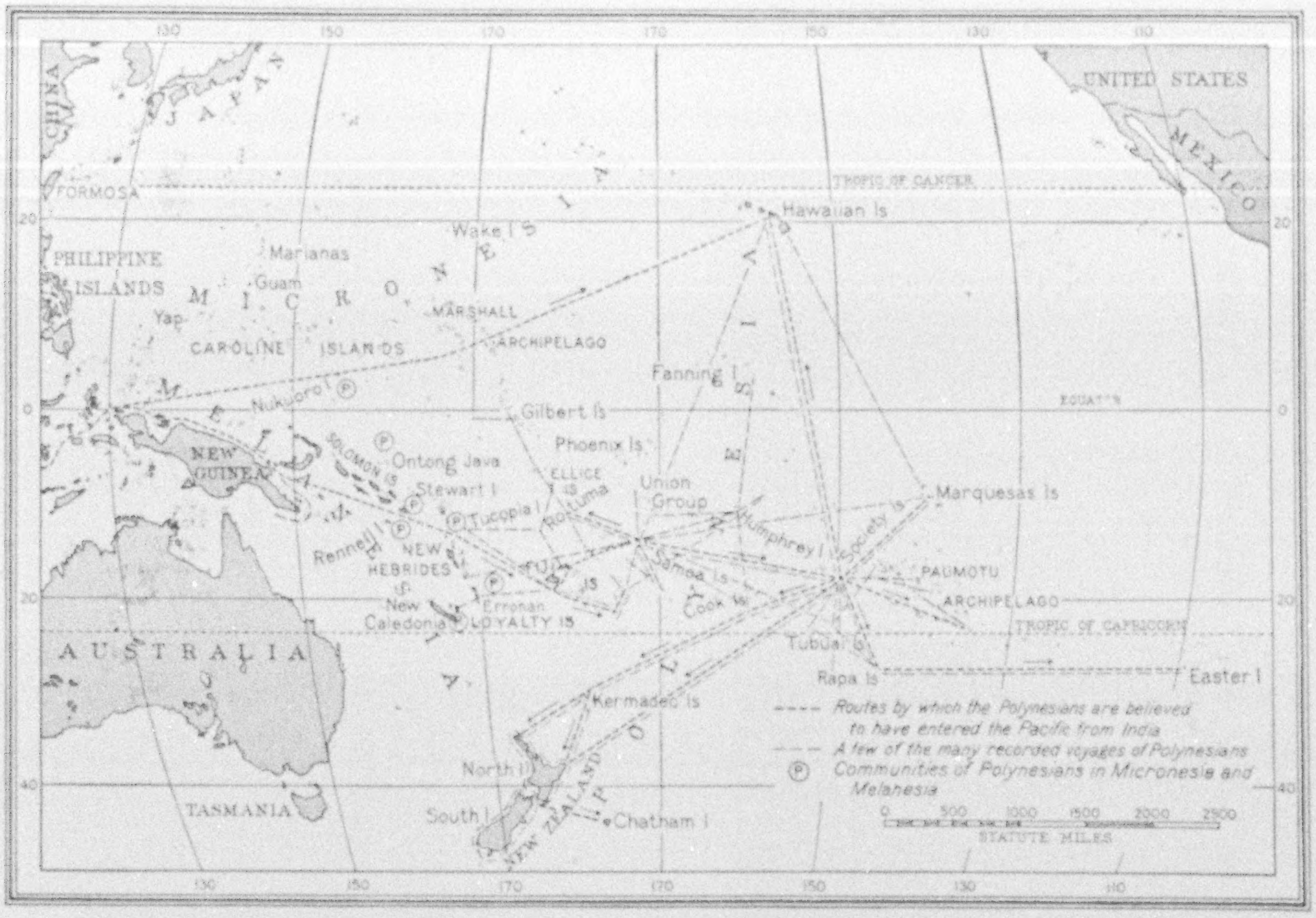
"Kalaimoku, a great warrior, who put down the rebellion in favor of idols, who sustained the position of prime minister of the nation, and was called the Iron Cable, passed by educated men and chose little Daniel Chamberlain, five years old, to be his teacher in learning the English alphabet.

"When Mrs. Chamberlain started to go to church with her family, by the time she got there she was as destitute of children as young married ladies. One queen would secure a child, another a second, and so on. (We had ten queens in those days.) . . .

"The winning influence they [the children] exerted over the minds of natives in causing the mission so quickly to become the acknowledged teachers of the nation will never be appreciated in this life."

THE QUEEN ADOPTED NEW ENGLAND STYLES

The queen welcomed the New England costume as passionately as our modern ladies greet the latest styles from London and Paris. Mrs. Thurston, the slim young bride of 23, gives an amusing incident in her diary. The favorite wife of the king desired to borrow a dress from Mrs. Thurston.



Drawn by A. H. Bumstead

MAP SHOWING THE PROBABLE MIGRATION ROUTES OF THE HAWAIIAN ISLANDERS FROM ASIA

If those ancient Polynesian mariners could find the little Hawaiian Islands, which are more than 2,000 miles distant from the nearest starting base, it does not seem unreasonable to credit the supposition that some of them also voyaged occasionally to the American mainland.

"The favorite queen applied to me for one of my dresses to wear on the occasion [of a great feast]; but as it was among the impossibles for her to assume it, the request happily called for neither consent nor denial. She, however, according to court ceremony, so arranged a native-cloth *pau*, a yard wide, with ten folds, as to be enveloped round the middle with seventy thicknesses.

"To array herself in this unwieldy attire, the long cloth was spread out on the ground, when, beginning at one end, she laid her body across it and rolled herself over and over till she had rolled the whole around her.

"Two attendants followed her, one bearing up the end of this cumbrous robe of state and the other waving over her head an elegant nodding flybrush of beautiful plumes, its long handle completely covered with little tortoise-shell rings of various colors.

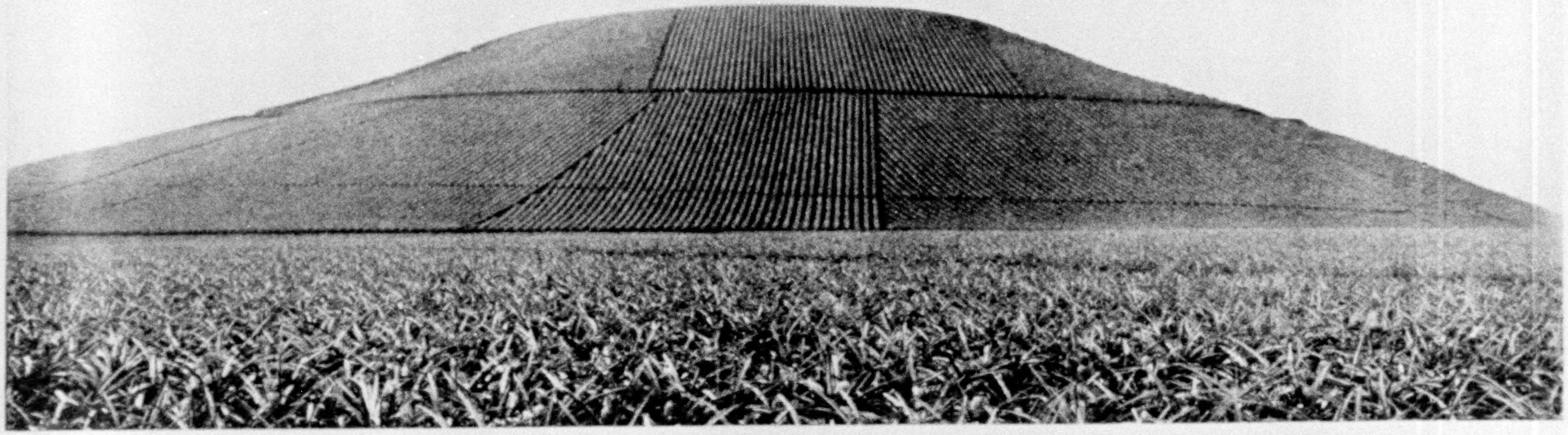
"Her head was ornamented with a graceful yellow wreath of elegant feathers of great value, from the fact that after a

FATHER DAMIEN

"The man who shut with his own hands the door to his sepulchre."—R. L. Stevenson.

© Pillsbury Picture Company

SUNSHINE ABOVE THE CLOUDS PHOTOGRAPHED FROM THE RESTHOUSE AT THE SUMMIT OF HALEAKALA (10,032 FEET), MAUI

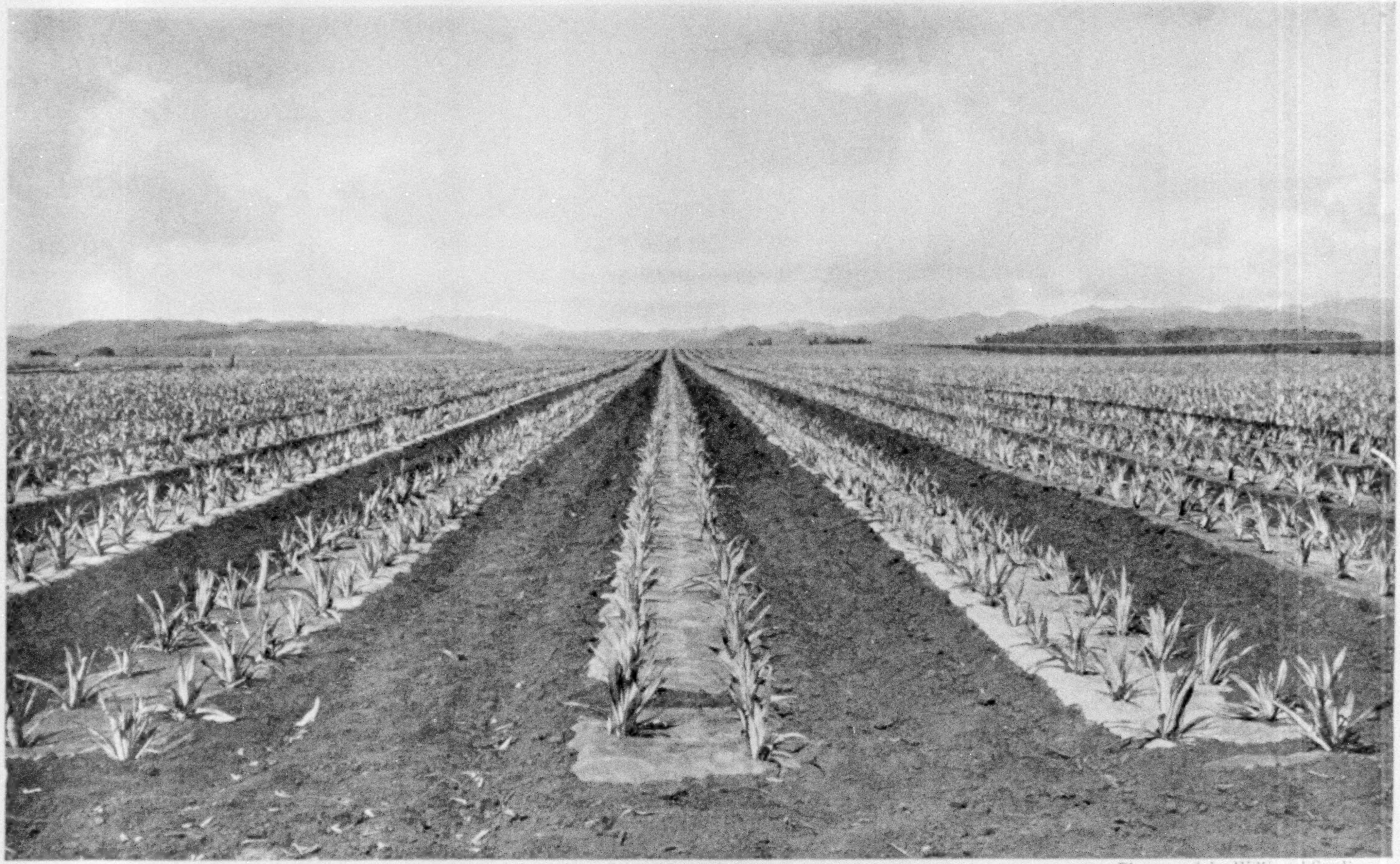


EVERY ACRE OF MOUNT WORTH AIKEN, MAUI, UNDER CULTIVATION OF PINEAPPLES

Photograph by Williams' Studio

A BIRD'S-EYE VIEW OF ONE OF THE GREAT PINEAPPLE PLANTATIONS OF THE HAWAIIAN ISLANDS: PHOTOGRAPH TAKEN FROM THE FAMOUS PALI OF HONOLULU (SEE PAGE 118)

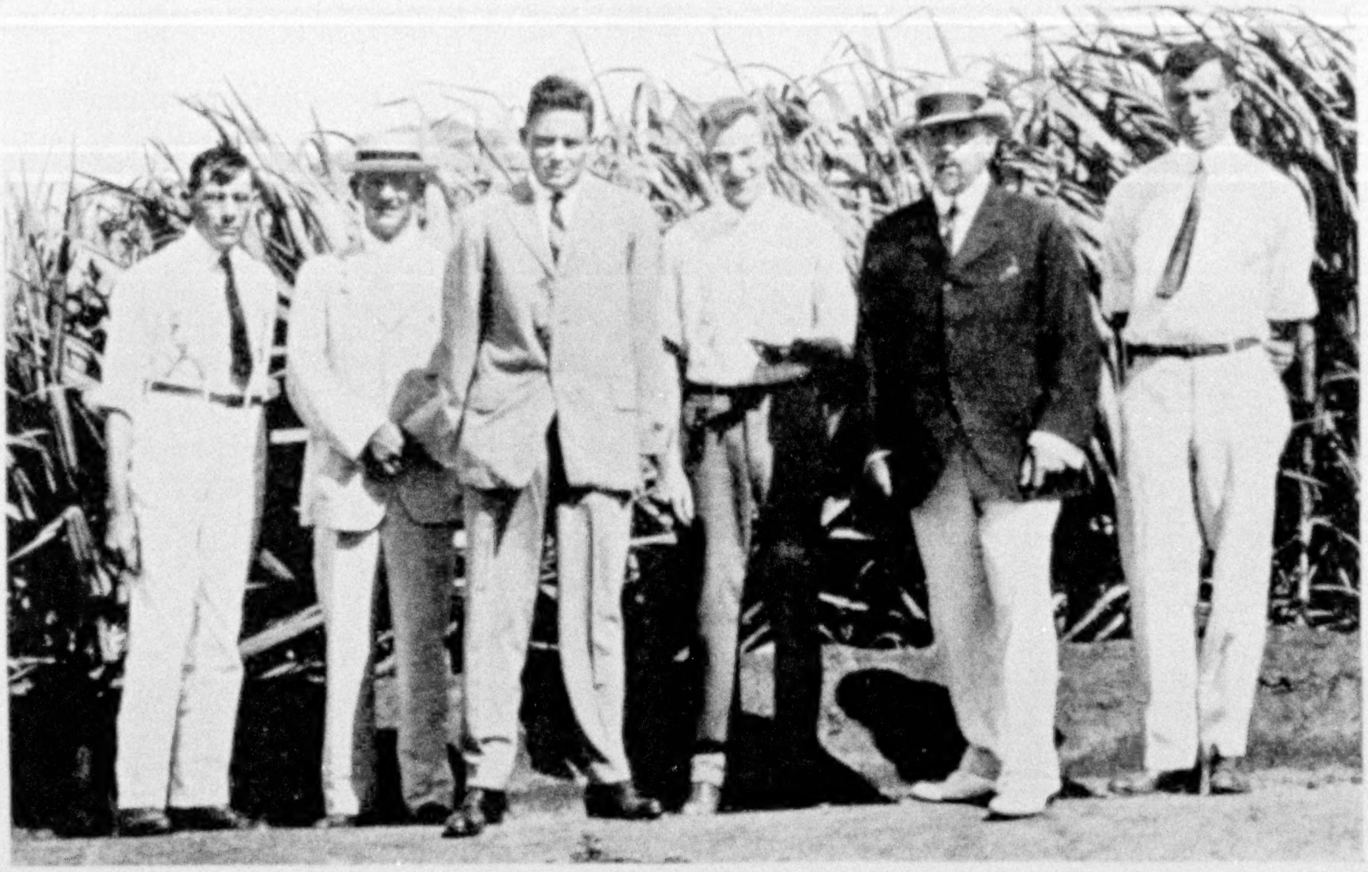
AN EXAMPLE OF THE FERTILITY OF THE SUGAR-CANE LANDS IN THE HAWAIIAN ISLANDS (SEE PAGE 153)



Photograph by Williams' Studio

PINEAPPLE PLANTATION ON THE ISLAND OF OAHU

Long strips of specially treated paper are laid over ground which has been carefully prepared. Through punctures in the paper, slips of pineapple are inserted. The paper, by conserving the moisture and subduing the weeds, increases the growth of the plant and the yield of fruit and also greatly reduces the labor of cultivation (see page 175).



THE EXPERTS OF THE EXPERIMENT STATION MAINTAINED AT HONOLULU BY THE HAWAIIAN SUGAR PLANTERS, THE WORLD'S FOREMOST RESEARCH INSTITUTION IN THE TROPICS AND SUBTROPICS (SEE PAGE 149)

mountain bird had been caught in a snare, but just two small feathers of rare beauty, one under each wing, could be obtained from it. A mountain vine, with green leaves, small and lustrous, was the only drapery which went to deck and cover her neck and the upper part of her person.

"Thus this noble daughter of Nature, at least six feet tall and of comely bulk in proportion, presented herself before the king and the nation, greatly to their admiration. After this presentation was over, Her Majesty lay down again upon the ground and unrolled the cloth by reversing the process of clothing."

NOTABLE FIGURES IN THE HISTORY OF MISSIONARY ACTIVITY

One might as well try to understand the United States without the story of the *Mayflower* as to endeavor to appreciate Hawaii without the story of the *Thaddeus* and the other little ships which carried to Hawaii successive bands of missionary pioneers—Titus Coan, G. P. Judd, David P. Lyman, Father Bachelot, Father Damien, Brother Dutton, Levi Chamberlain, Daniel Dole.

The spiritual ideals which those devoted men and women planted on these Islands are bearing fruit to-day as useful to Hawaii and to the United States as the fruit of the *Mayflower.*

In six years they translated the Bible into the Hawaiian language, which they had reduced to writing; in 30 years they taught the entire nation to read and write, so that at one time in the nineteenth century it was the boast of the islanders that they were the most literate people in the world, with the smallest percentage of persons who could neither read nor write.

They saved the Hawaiian race from such ravages of disease and ignorance as decimated the islanders of the South Pacific.

They hitched Hawaii's wagon to a star. They pointed the way which their descendants and the thousands of splendid men and women who have since made the Hawaiian Islands their home have zealously followed.

It was their children and grandchildren who guided the successive sovereigns of Hawaii in preventing its absorption by European powers, and who, when the islanders had outgrown the monarchy, led the movement for independence and ulti-

Photograph by Robert K. Bonine

A RICE FIELD ON THE ISLAND OF OAHU

In the right background rises the "Punchbowl," crater of an extinct volcano in the center of Honolulu. It has been proposed recently to erect in this crater a huge modern athletic stadium, having a seating capacity of 95,000. A football gridiron, baseball diamond, cinder paths for track meets, and a number of tennis courts will be constructed on the floor of the bowl.

mate entrance of the Territory of Hawaii as an integral part of the United States.

ANNEXATION A BOON BOTH TO THE UNITED STATES AND HAWAII

The annexation of the Hawaiian Islands by the United States has turned out to be as good a bargain for the entire United States as it has proved for the Islands themselves.

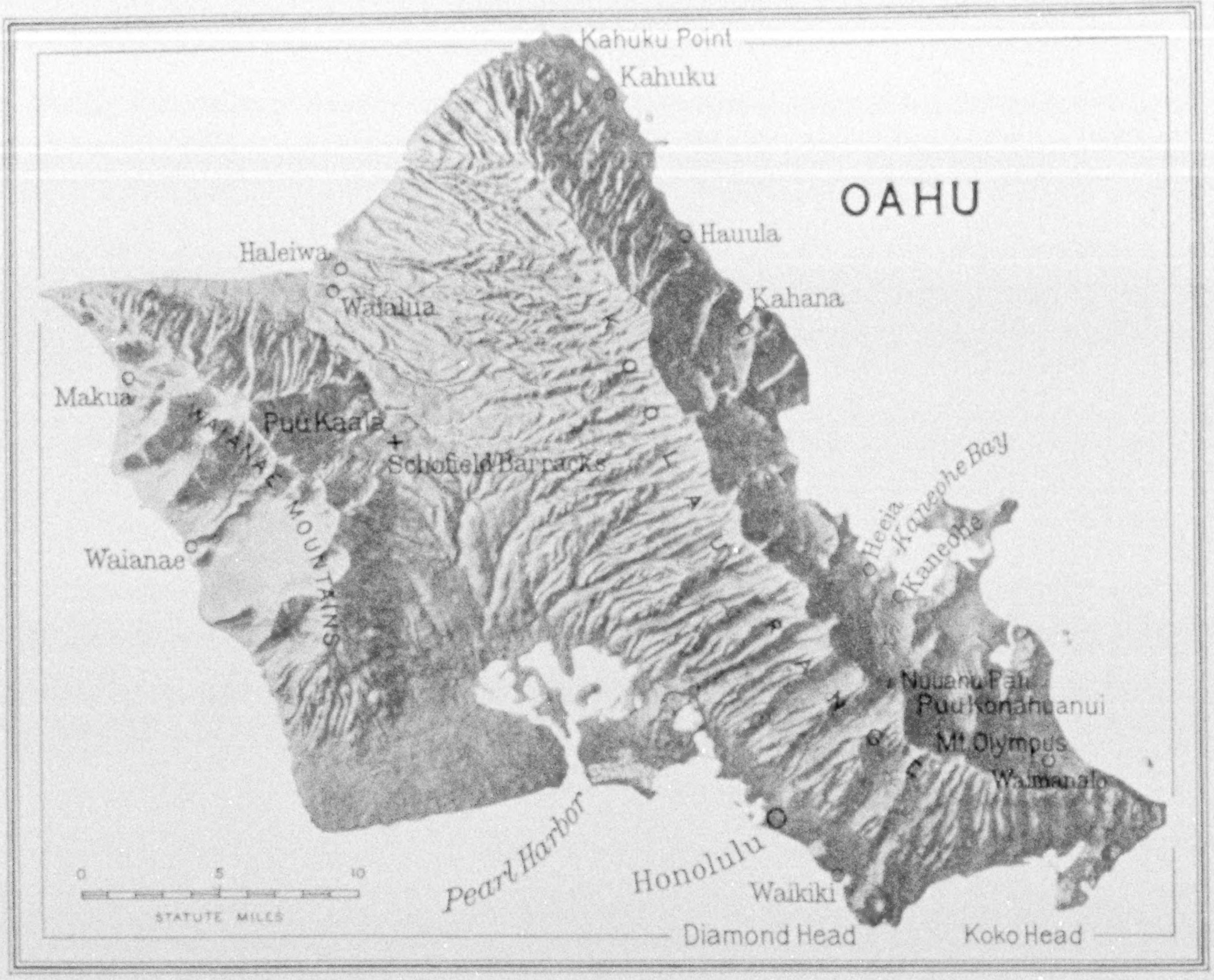
Great as is the value of Hawaii as the first line of America's military and health defense in the Pacific, these advantages are ours without the net expenditure of a single dollar of mainland money.

The people of Hawaii not only pay for the operation of their own government, but in addition contribute largely to the National Treasury at Washington to reimburse it for present-day expenditures for the Territory's defense.

In the fiscal year of 1921 the people of the Territory of Hawaii paid into the Federal Treasury, in customs duties, income taxes, and internal revenue taxes, a sum in excess of $22,000,000; in 1922 they paid more than $16,500,000. The cost of maintaining the customhouses, the Federal courts, the postal establishment, and other national functions in the Islands represents a very small fraction of these Federal taxes remitted by the Territory to Washington.

Easily, the net payments into the Federal Treasury at Washington in 1921 and in 1922 were much more than the outlay in recent years for fortifications and naval-base improvement, which fortifications, be it remembered, are primarily for the benefit of the whole United States.

Indeed, these payments go far toward covering also the entire cost of main-



A RELIEF MAP OF THE ISLAND OF OAHU

From this sketch the reader can easily picture the precipitous ravines that have been gouged by the torrents of water which, carried by the easterly trade winds, are intercepted by the mountain tops (see pages 141 and 145).

taining such troops as are necessary for the peace-time protection of the Islands and of providing post facilities for such additional troops as would be required for a war-time garrison.

The revenues which the people of Hawaii forward to the Washington Government equal all that they spend for the maintenance of their schools and roads, police protection, agricultural research, health agencies, etc.

Thus not only do they give Uncle Sam a dollar for every one they spend on themselves, but they do it with a willingness and a pride in the causes of the Nation that make them peculiarly entitled to the consideration of their fellow-countrymen on the mainland.

The quarter of a century that has now passed since the American flag first floated over Hawaii has seen its people develop a loyalty to that flag and a devotion to the Republic's ideals that are not excelled even in those States whose proud boast may always be that they are of "The Original Thirteen."

HAWAIIAN ISLANDS ARE NOT "INSULAR POSSESSIONS"

The people of Hawaii are sensitive on the score of the popular misconception obtaining in America, that their territory is one of the *insular possessions* of the United States. Only a few months ago the territorial legislature passed an act, characterized as a Bill of Rights, setting forth the fact that the Islands became an integral part of the United States by treaty rather than by purchase or conquest. The distinction, their citizens maintain, should entitle them to all the benefits of congressional legislation and appropriations in aid of good roads, education, farm loans, maternity, home economics, training in agriculture, trade and industry, and other acts of a like nature

Photograph by Herbert B. Turner

THE PUBLIC LIBRARY, HONOLULU

Becoming aroused some years ago by the increase in garish advertising billboards which interrupted the lovely vistas of mountain and turquoise sea, the women of the Outdoor Circle notified the merchants of Honolulu and of the mainland that they would purchase no goods so advertised. They prosecuted their campaign so vigorously that to-day there is not a single advertising billboard on the island of Oahu. These ladies were instrumental also in planting thousands of oleanders, pink and yellow shower-trees, poincianas, coconuts, etc., which now in gorgeous bloom decorate every landscape.

THE FUNERAL OF A HAWAIIAN PRINCE

Photograph and copyright by Roselle F. Faast

THIRTY-TWO GIRLS, EACH OF A DIFFERENT RACE OR RACIAL COMBINATION, ALL ATTENDING KAWAIAHAO SEMINARY, HONOLULU: A STRIKING ILLUSTRATION OF THE MIXTURE OF RACES THAT IS TAKING PLACE IN HAWAII

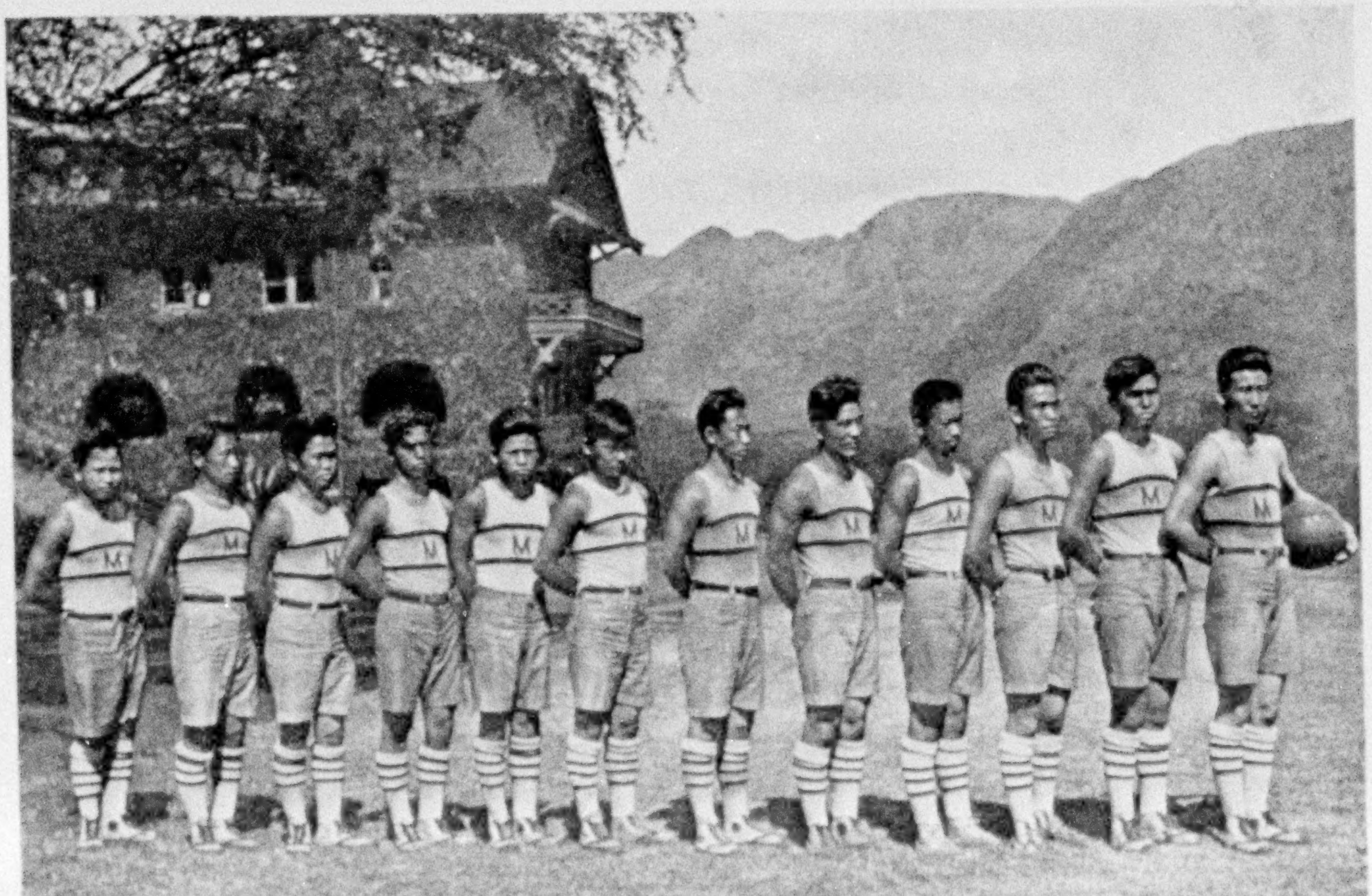
1. Hawaiian; 2. Ehu Hawaiian; 3. Japanese, 4. Chinese; 5. Korean; 6. Russian; 7. Filipino; 8. Portuguese; 9. Polish-Russian; 10. Hawaiian-German; 11. Hawaiian-Chinese; 12. Hawaiian-Russian; 13. Hawaiian-American; 14. Hawaiian-French; 15. Hawaiian-Portuguese; 16. Hawaiian-Filipino-Chinese; 17. Hawaiian-Indian-American; 18. Hawaiian-Japanese-Portuguese; 19. Hawaiian-Portuguese-American; 20. Hawaiian-Spanish-American; 21. Hawaiian-German-Irish; 22. Hawaiian-Spanish-German; 23. Hawaiian-Chinese-American; 24. Hawaiian-Portuguese-Irish; 25. Hawaiian-Japanese-Indian; 26. Hawaiian-Portuguese-Chinese-English; 27. Hawaiian-Chinese-German-Norwegian-Irish; 28. South Sea (Nauru)-Norwegian; 29. African-French-Irish; 30. Spanish-Porto Rican; 31. Guam-Mexican-French; 32. Samoan-Tahitian.

Photograph from Howard D. Case

THE AUDIENCE AT AN OPEN-AIR MOTION-PICTURE SHOW

Honolulu public school children of Central Grammar School at a community picture.

JAPANESE CHILDREN CELEBRATING A FLOWER FESTIVAL: HAWAIIAN ISLANDS



Photographs by Robert K. Bonine

THE SOCCER FOOTBALL TEAM OF THE MID-PACIFIC INSTITUTE, AT HONOLULU

which apply to the States of the Union as a whole, but which have not been extended to Hawaii.

Nineteen States, including Nebraska, Maine, Florida, Alabama, South Carolina, Arkansas, New Hampshire, Delaware, Utah, Mississippi, Vermont, Montana, South Dakota, Arizona, Idaho, Wyoming, North Dakota, New Mexico, and Nevada, paid less per State into the National Treasury in 1921 than did Hawaii. Each is allotted Federal aid, but the Territory of Hawaii is excluded.

EXPECTATIONS MORE THAN REALIZED

Our visit was in the months of June and July. Here again we found we were running contrary to prevalent advice. "Going to the subtropics in early summer? A geographer ought to know better," was the frequent comment of our friends; but our expectations of a delightful season were more than realized.

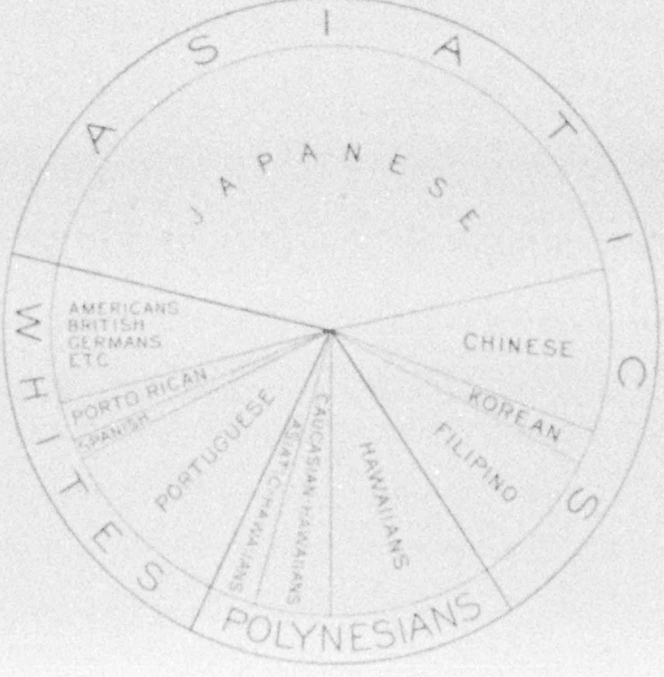
The voyage from the mainland occupies six or seven days, through quiet seas that become daily more enchanting in color and in charm of cloud and sky as we approach the Islands.

Nor does the visitor, however well prepared by reading and by conversation with Hawaiian advertisers, escape amazement at the great enterprising metropolis of Honolulu which greets him in these lonely islands in mid-Pacific—vociferous taximen, flivvers and luxurious limousines, spacious hotels, many miles of suburban concrete roads; morning and afternoon newspapers that publish long press dispatches from the mainland and even give the daily quotations of the New York stock markets and the big league baseball scores; large department stores thronged with buyers and displaying the latest New York, London, and Paris fashions; a great university plant and fine public school buildings; a superb country club, with golf courses that can compete with our best national links; a Carnegie library; electric trolley cars whose fares are regulated at Washington, 5,000 miles away; a canning factory that puts up more than one million cans of pineapples in one day, a world-famous agricultural experiment station, and countless other manifestations that we have entered an American-minded community.

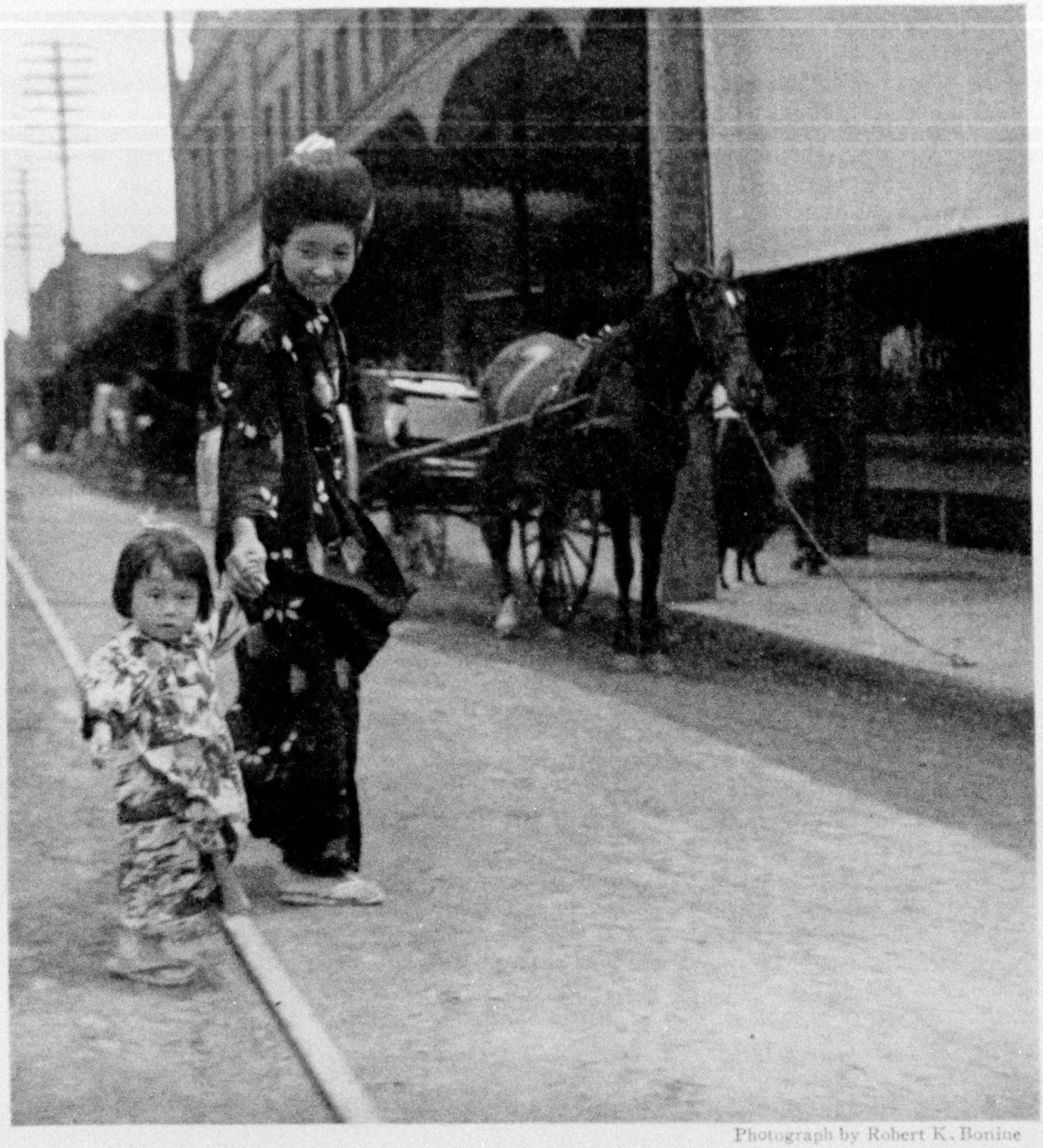
"The mercury stands at 80°, but there

Photograph by Harriet Chalmers Adams

A NOTICE POSTED IN FIVE LANGUAGES: ENGLISH, HAWAIIAN, PORTUGUESE, CHINESE AND JAPANESE



A DIAGRAM SHOWING THE RACIAL PROPORTIONS OF THE POPULATION OF THE HAWAIIAN ISLANDS



Photograph by Robert K. Bonine

"MORE THAN 40 PER CENT OF THE POPULATION OF THE HAWAIIAN ISLANDS IS JAPANESE" (SEE TEXT, PAGE 176)

is no sultriness; a tremulous sea breeze and a mountain breeze fan the town, and the purple nights, when the stars hang out like lamps and the moon gives a light which is almost golden, are cool and delicious."

Our first excursion is up Nuuanu Valley to view the grand panorama from the precipice called the Pali (see page 118), which is Oahu's scenic lion.

Geologists assert that we are looking down into what is left of an immense volcanic crater which ages past was 25 miles in diameter. One-half of the crater has sloughed off into the ocean.

"The Pali is a natural wonder, that as a genuine surprise has nothing to equal it in all the world. From its sheer edge, the splendid panoramic view of the windward side of the island is spread out at the observer's feet—a view of rugged mountains, of cliffs, of country side, of quiet bays, of coral strands, and of the open sea that has beggared the descriptive powers of the most gifted.

"Here the observer comes to appreciate not only the stupendous constructive power of Nature that has called the island into being, but also those destructive agencies which, through countless cen-

turies, have been tearing down the solid rock, disintegrating, transporting, and distributing it, according to well-established natural laws." *

With its long, vertical crater wall standing abreast of the northeast trade winds, and with the elevation and other conditions favorable to bring about an abundant rainfall on the leeward side, it has been furrowed from end to end into a series of deep lateral valleys, like the fluted pipes of an organ.

Perhaps our most vivid memories of this world-famous view are the enchanting notes of the Manchurian thrush which, imported some years ago, now nest abundantly among the peaks and cliffs, and which were calling to their mates in exquisite song.

Judging from our experience, the trades rush across the Pali with as great force as when Admiral Wilkes visited it 80 years ago and noted in his record, "On reaching the Pali beware of losing not only your hat, but yourself; for when the trade is blowing strong, it is impossible to stand with safety."

Photograph by Herbert B. Turner

A PICTURE BRIDE: HONOLULU (SEE PAGE 176)

These Hawaiian mountains, rising from the water to 5,000, 10,000, and 13,000 feet, have given the Territory of Hawaii a variety of climate that is unique.

I quote from Lawrence H. Daingerfield, the brilliant meteorologist, who for several years was the division chief of the United States Weather Bureau, stationed at Honolulu:

"One would have to travel far afield to discover another area of 6,454 square miles, constituting the eight main islands of the Hawaiian group, over which so wide a range of rainfall may be gaged.

SOME PHASES OF HAWAIIAN CLIMATE

"Nestled in the lap of the great Pacific and crescented like the bow of some giant archer, the islands are subject to the caressing and sometimes battling trade winds bringing from the sea their burden of moisture. These trades are the old faithfuls that sweep the windward plains, slopes, and palis and bathe the mountain crests and precipices with some of the greatest torrents from the clouds known to man.

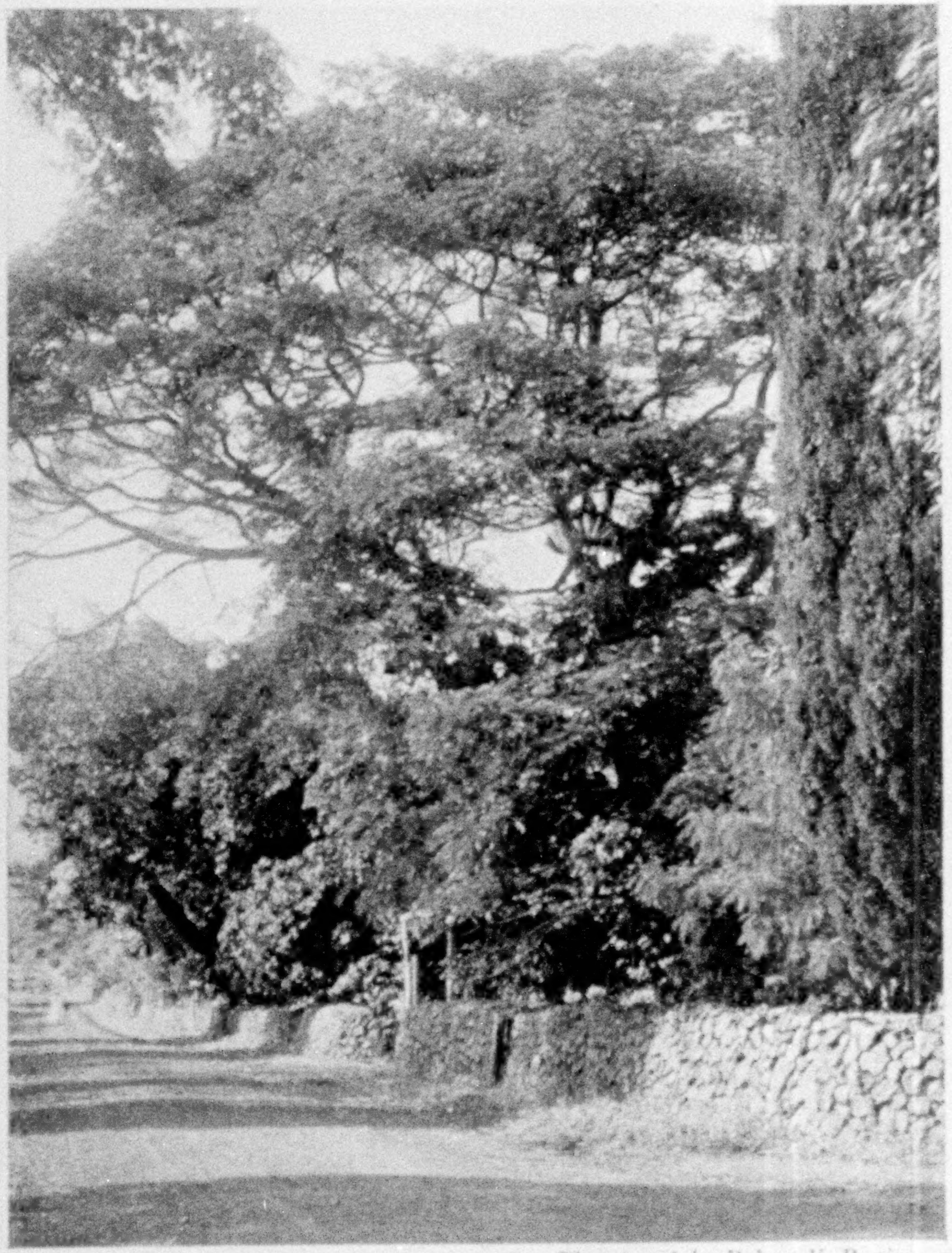
"Yet, when we pass down the leeward slopes and out over the volcanic red plains, we find a dry realm of such startling

* From William Allison Bryan's very remarkable work, "Natural History of Hawaii."

Photograph by Dr. Albert S. Baker

A NINETY-SEVEN-YEAR-OLD HAWAIIAN IN FRONT OF HIS COFFEE TREES: KONA, HAWAII

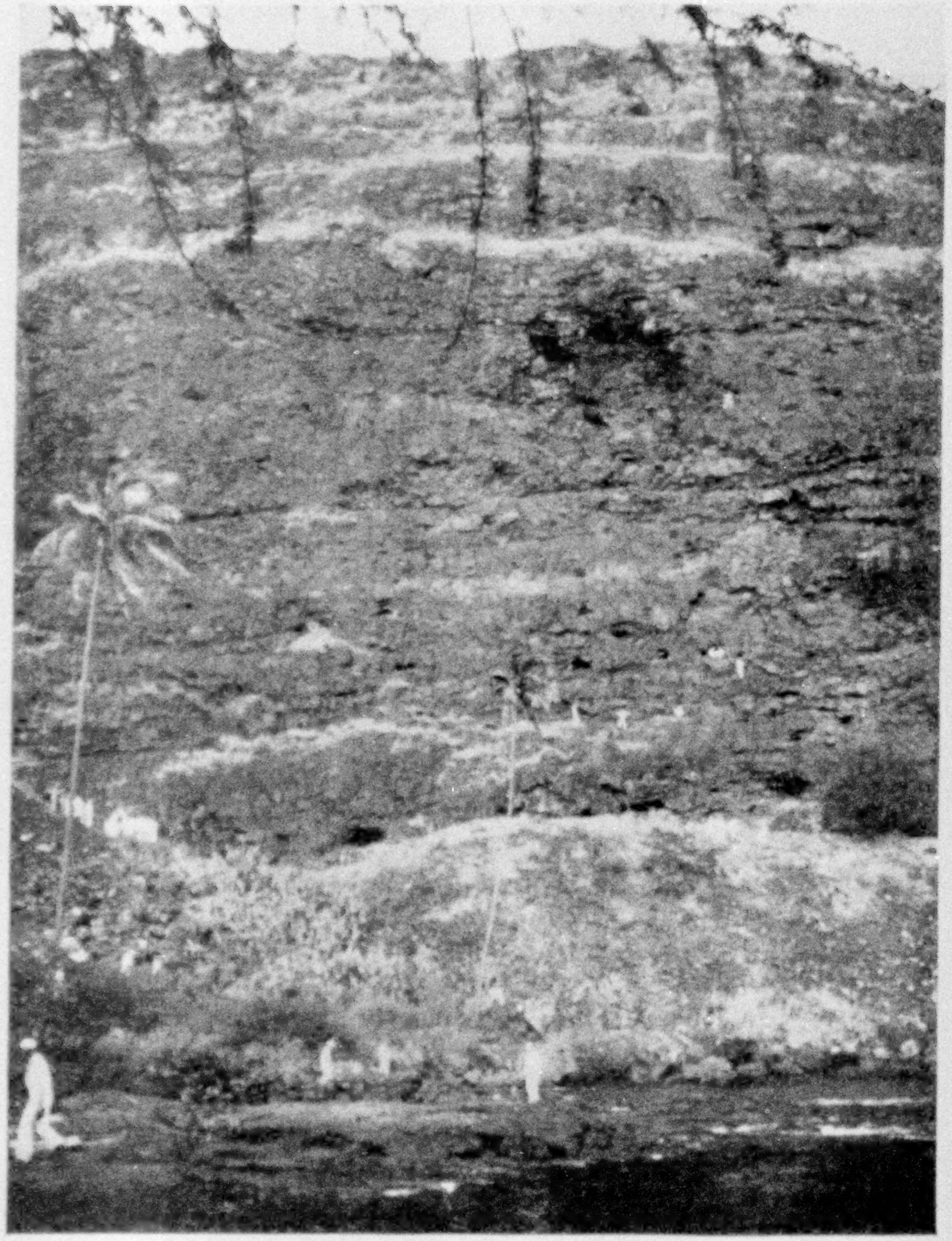
Kona coffee is famous with all who know it. An acre of trees has yielded as high as 24 hundred-pound bags of dry coffee.



Photograph by Robert K. Bonine

THE VILLAGE OF WAIOHINU, WHERE MARK TWAIN PASSED "A YEAR OF VAGABONDAGE"

He was refused a job on a newspaper in Honolulu because the editor declared he appeared to be too lazy.



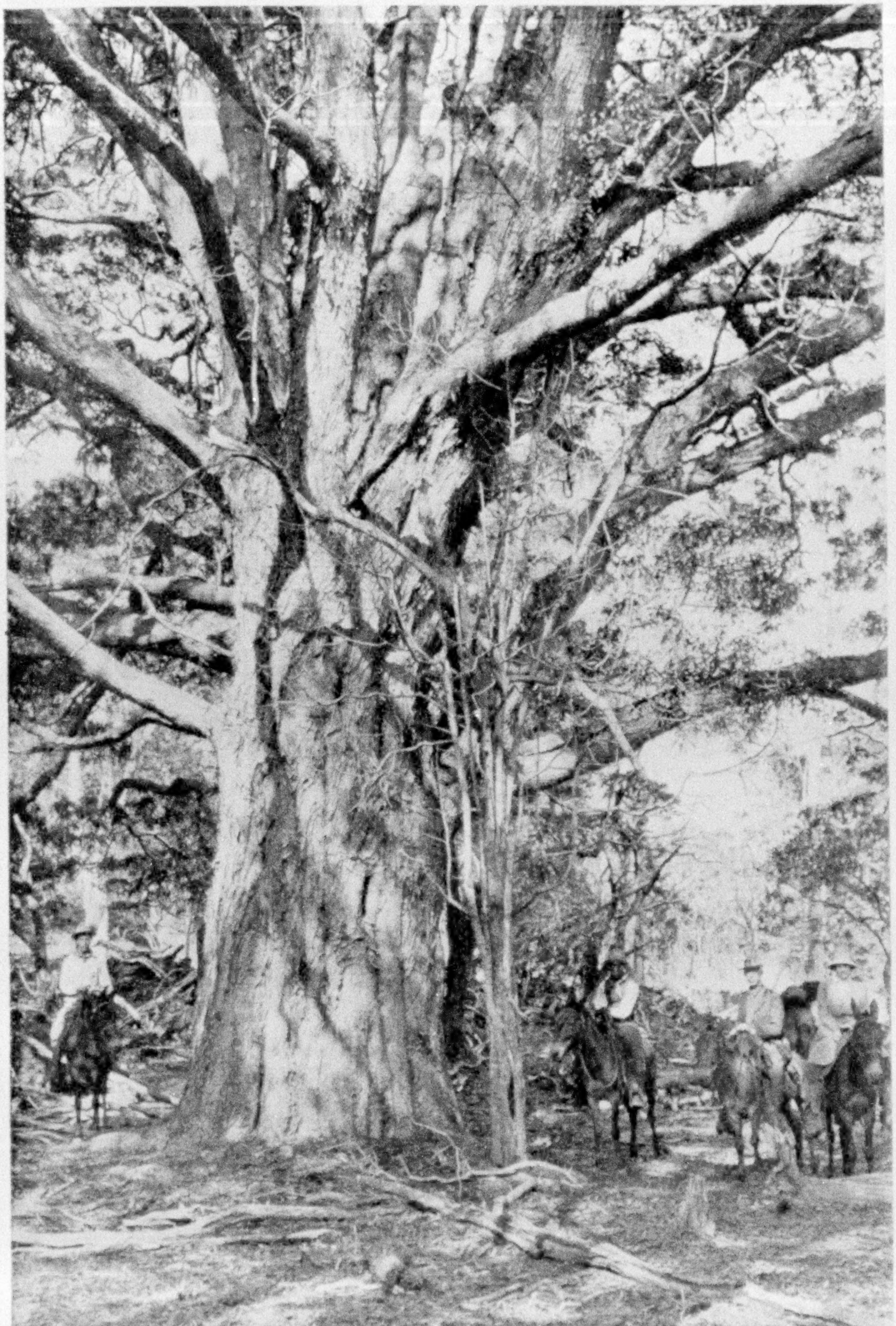
Photographs by Dr. Albert S. Baker

SAILORS FROM THREE VISITING WARSHIPS CLIMBING THE NEARLY PERPENDICULAR WALLS OF THE PALI

They are about to enter the ancient burial caves near the monument to Captain Cook, discoverer of the Islands (see text, page 117).

ANCIENT SALT WORKS FOR THE EVAPORATION OF SEA WATER: ISLAND OF HAWAII

Water shows in three of the dozen large hollowed stones near the modern lighthouse, not far from where Captain Cook was killed.



Photograph by Gilbert Grosvenor

A GIANT KOA TREE IN THE BIRD FOREST, HAWAII NATIONAL PARK

It was from similar trees that the ancient Hawaiians with their stone implements laboriously hewed their ocean-going canoes (see text, page 116).

contrast that much substantiation is necessary to be convincing.

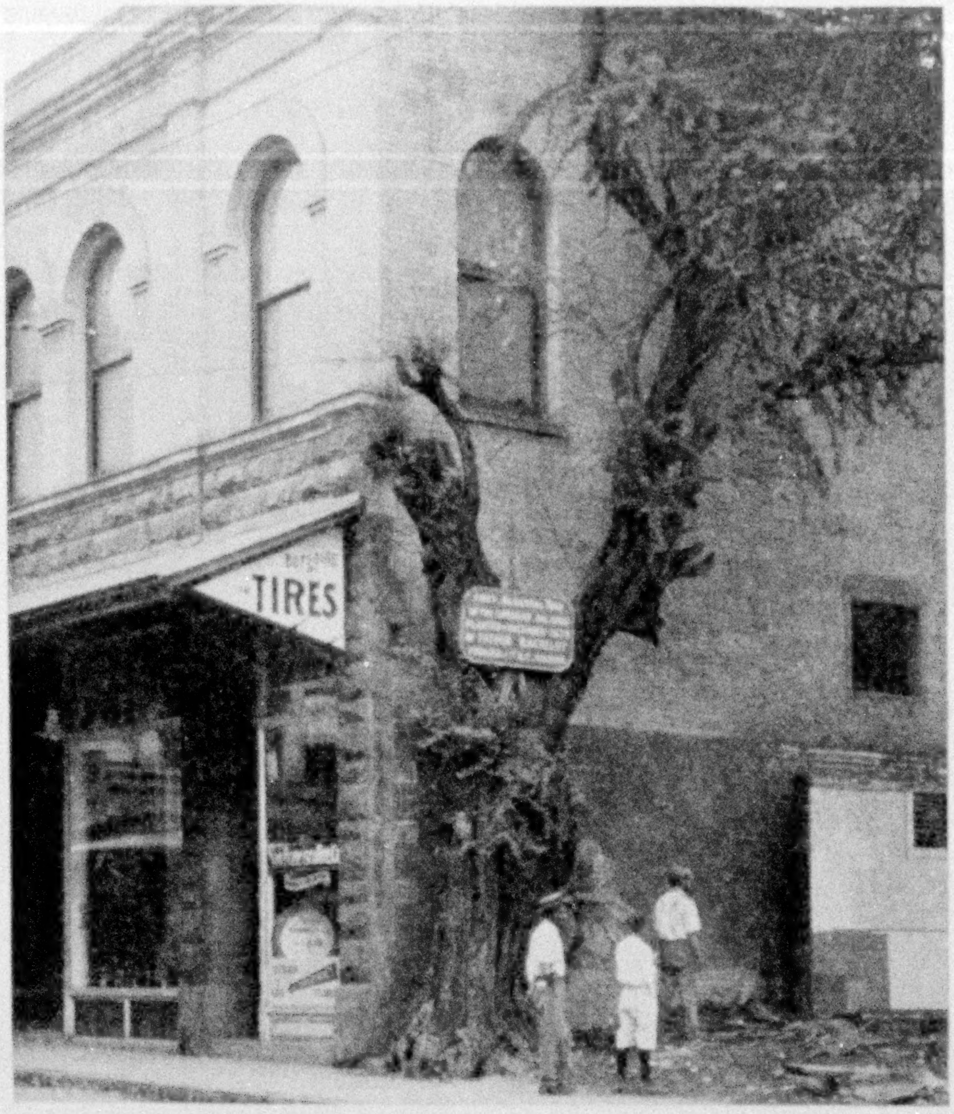
"Awini, at an elevation of 2,100 feet in the North Kohala hills of Hawaii, has an annual rainfall of 167.68 inches, while a yearly amount of only 16.60 inches is gaged at Mahukona, about nine miles leeward.

"Nahiku, windward of Haleakala, Maui, receives annually about 300 inches, while Waiopai Ranch, leeward of Haleakala, and perhaps 14 or 15 miles from Nahiku, gages normally only 25.39 inches.

"Puu Kukui (Upper), West Maui, elevation 5,000 feet, receives normally 370 inches, while Camp No. 7, only about 8½ miles distant, near the west side of the Maui Isthmus, elevation 90 feet, receives only 15.66 inches.

"The greatest and least amounts of precipitation ever gaged in the Territory in a full year are likewise found at Puu Kukui (Upper), which received 562 inches in 1918, and Camp No. 7, with only 2½ inches in 1912.

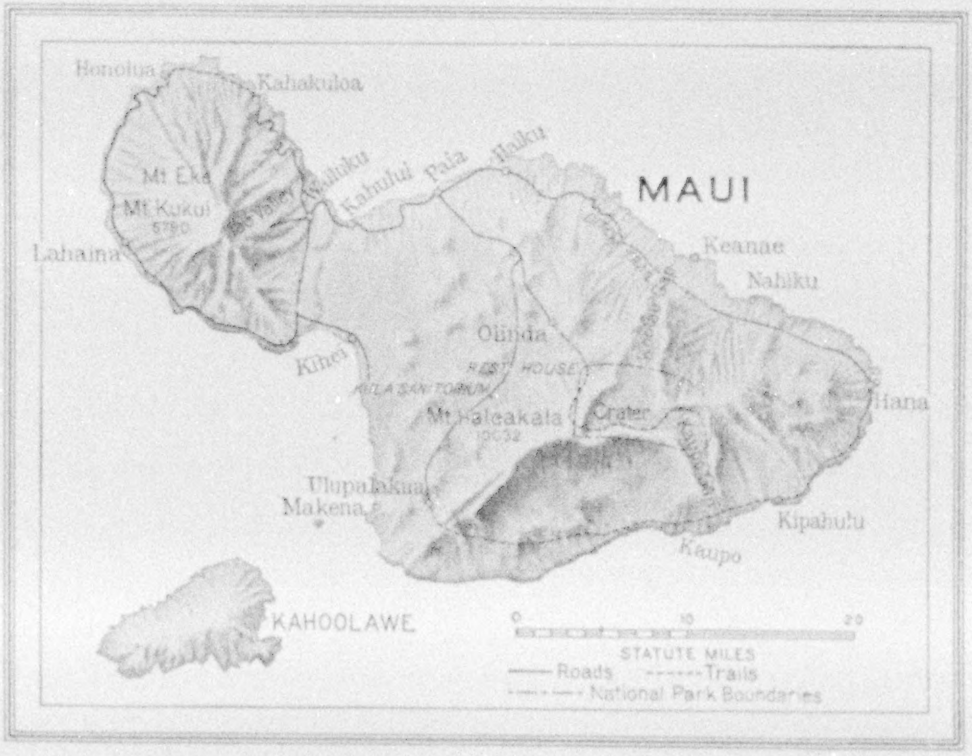
"The wet places mentioned are dry, however, when compared with Mt. Waialeale, Kauai, elevation 5,080 feet, and the crest of the island. Here is gaged annually a normal amount of approximately 476 inches—an amount probably unequaled elsewhere in the world, as Cherrapunji, in the Khasi Hills of India, long a claimant



Photograph from L. W. de Vis-Norton

THIS WEARY OLD TREE IS THE PROGENITOR OF MANY THOUSANDS OF ALGAROBA TREES

This species now affords food, fodder, firewood, and shade in areas that, previous to its introduction by Father Bachelot nearly 100 years ago, were arid deserts.

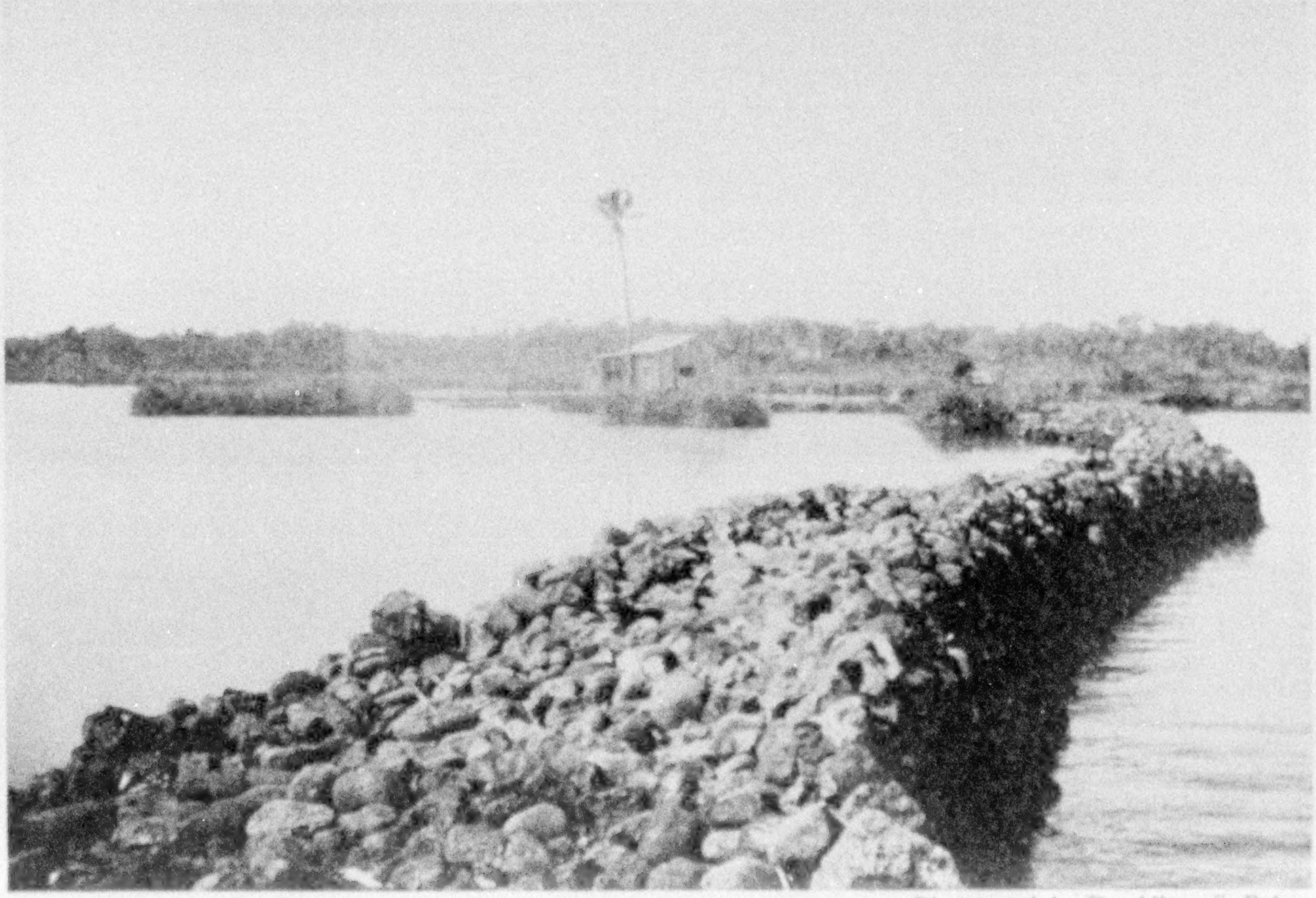


Drawn by A. H. Bumstead

RELIEF MAP OF THE ISLAND OF MAUI

Photograph by Robert K. Bonine

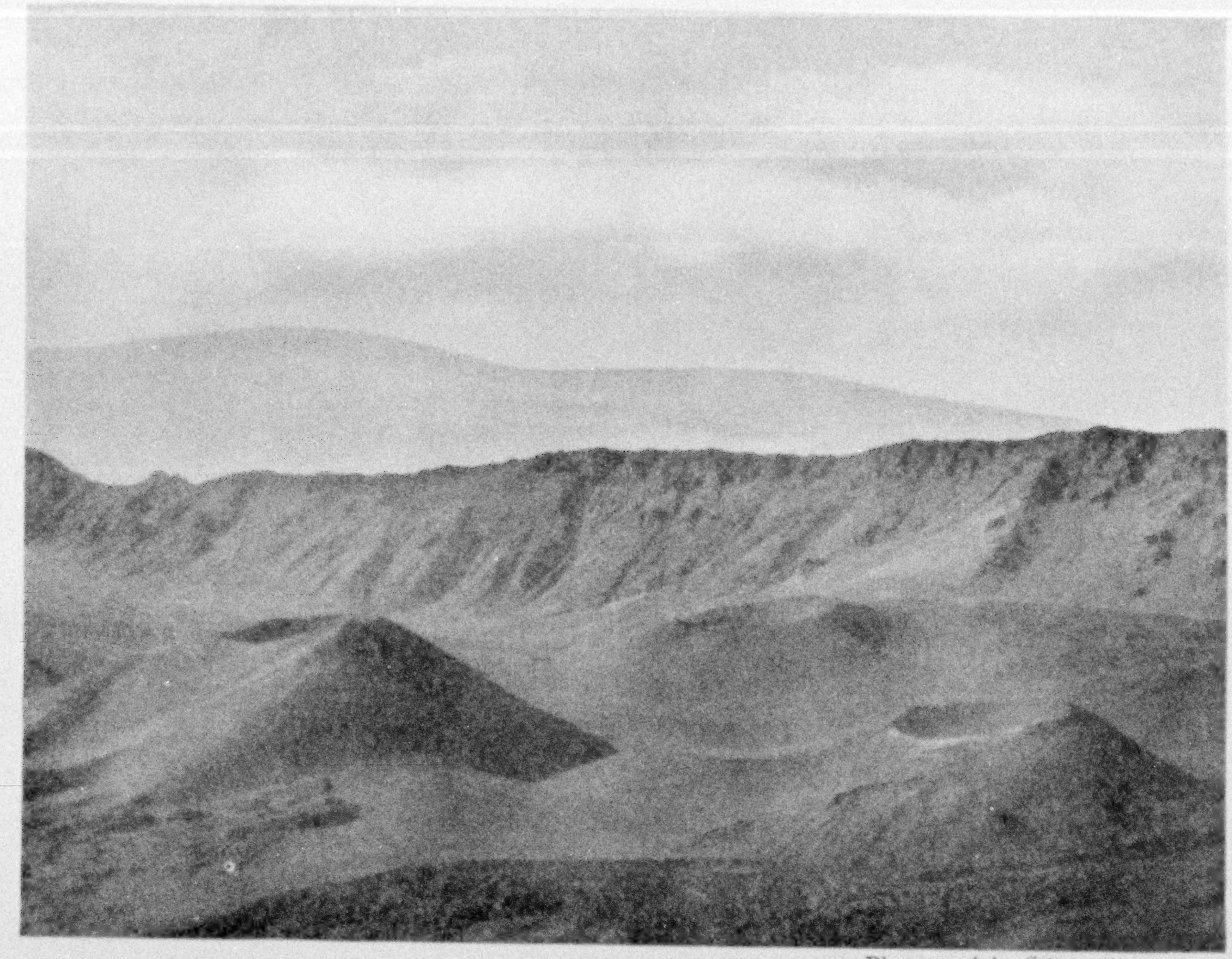
ON THE RIM OF HALEAKALA, THE WORLD'S LARGEST DEAD VOLCANO: (SEE ALSO COLOR PLATES VIII AND IX)



Photograph by Dr. Albert S. Baker

THE ENCLOSING WALL ACROSS AN ARM OF THE OCEAN FORMING AN ANCIENT FISH POND NEAR HILO, HAWAII

The fish kept inside the enclosure are chiefly mullet (see also page 122).



Photograph by Gilbert Grosvenor

A VIEW OF A SMALL CORNER OF HALEAKALA CRATER, ISLAND OF MAUI

Ages ago its fires were stilled and the scene of its former fury is now one of the coldest places in the Pacific. Peering through the clouds, 100 miles away, are the summits of Mauna Kea and Mauna Loa on the island of Hawaii (see Color Plates VIII and IX).

for first honors for wetness, seems to have fallen into second place, with 426 inches of rain annually.

"Only some fourteen or fifteen miles leeward of Mt. Waialeale, however, we find a quick surrender to dryness, and Waiawa, at an elevation of 35 feet, receives annually a normal amount of 22.21 inches.

"The higher levels of Mauna Loa and Mauna Kea, Hawaii, and Haleakala, Maui, are frequently white with snow during the colder months of the year, and transient snow has been seen on the crest of Mt. Waialeale, Kauai. It is not unusual to see snow banks on the crests of Mauna Kea and Mauna Loa in midsummer, thus indicating persistent frost at those desolate altitudes, even though tropical verdure luxuriates at their bases in perennial summer.

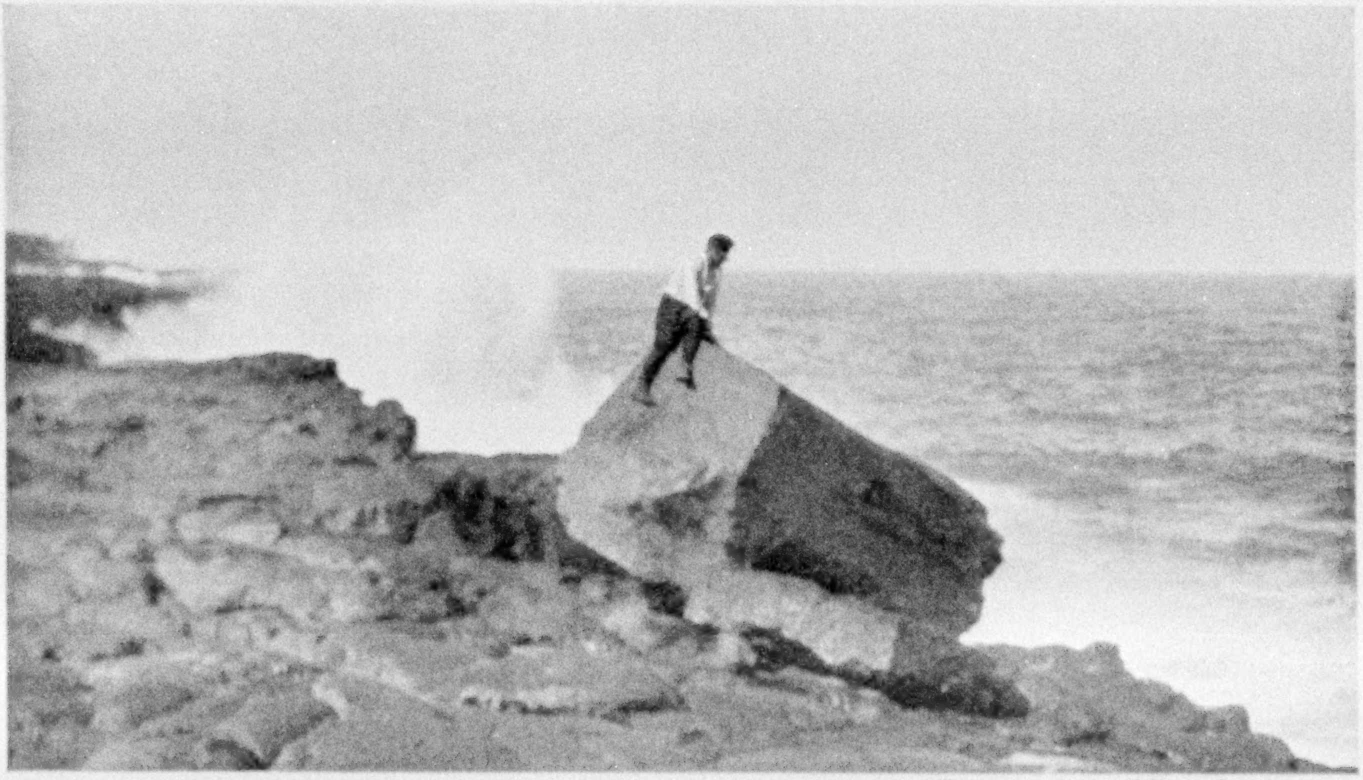
"It is doubtful if frost ever forms much, if any, below the 2,500-foot level over the entire group of islands, and rarely below 4,000 feet.

"The tenaciousness of the trade winds through all seasons and over all islands of the group (aside from a limited area leeward of Haleakala and over the Kona districts of Hawaii), the persistently equable temperature which passes through the cycle of seasons devoid of extremes, the abundant moisture, especially over the windward slopes, and the lack of tropical storms, known elsewhere in the Tropics as typhoons or hurricanes, add to the desirability of the climate from the standpoint of recreation and pleasure, as well as the more practicable pursuits of life.

"From the warmth of the continuous low-level summer to the chill of the persistent high-level winter, from the arid plains to zones of frequent and heavy rains, from the sunshine of Lahaina, Honolulu, and Waimea districts to the cloud- or fog-draped crests of Mauna

THE LOVELY STRAND OF PUNA: ISLAND OF HAWAII

The visitor finds endless enjoyment in the contrast of the pure-white surf and jet-black sand, which sparkles like anthracite and is as clean as snow; in the rustling green palms, the soft, sweet fragrance of the ocean zephyrs, and the exciting search for great sea turtles which abound along this shore.



Photographs by Gilbert Grosvenor

A LAVA ROCK HURLED ABOVE THE CLIFF BY A TIDAL WAVE: PUNA

Photograph by George Shiras, 3d

LOOKING DOWN UPON THE LEPER SETTLEMENT ON MOLOKAI

Loa, Mauna Kea, Haleakala, and Waialeale, one finds, perhaps, greater climatic changes than can be found elsewhere upon the face of the earth within so limited an area."

THE VISITOR CAN CHOOSE HIS OWN CLIMATE

Roughly computed, the annual mean temperature is 75.55°, with a divergence in either direction of 7.55°. As a general rule, the temperature is cooler by four degrees for every thousand feet of altitude, so that people can choose their climate to suit themselves without leaving the Islands.

We had an amusing illustration of the variety of climate on Oahu. We had requested the privilege one morning of viewing a noted Japanese garden at Waikiki. The owner, with typical Hawaiian hospitality, immediately assented, and added that his wife would be happy to receive us, but he was not sure that he could locate her at such short notice. He had a town house in Honolulu, the Japanese villa at Waikiki for surf-riding, a mountain retreat on Nuuanu, a ranch house on the dry plateau near Schofield Barracks, and a bungalow on the rainy northeast shore. All these establishments were within two hours' ride, and yet each had an entirely different atmosphere. As he had failed to ask his wife in the morning what kind of climate she had selected for the day, he was at considerable trouble to find her.

SUGAR PLANTATIONS ESTABLISH WORLD-FAMOUS EXPERIMENT STATION

The 47 sugar-producing corporations of the Islands have combined to support a world-famous experiment station in Honolulu, so that whatever one producer learns in the way of making his acres yield more sugar and of reducing the per-pound cost of production at once becomes the property of all.

Samples of soil from every cane field in the Islands are forwarded yearly to the experiment station, where they are analyzed and an appropriate ration formulated for the field, and the type of cane selected that experience has proved will do best on that particular soil. Every sugar planter contributes to the support of this station.

Soil analysis, seedling introduction,

A PORTRAIT OF OLD STUMPLEG, WHOSE UNIQUE CAREER IS DESCRIBED IN THE TEXT (SEE PAGE 189). DRAWING BY LOUIS AGASSIZ FUERTES

cane-disease prevention, variety adaptation, and parasite elimination have all served to enable the Territory of Hawaii to lead the world in the acreage production of sugar and have made all sugar-yielding centers look to it for guidance in the handling of the industry.

On the windward side of the island of Hawaii sugar can be grown without irrigation. The rainfall is abundant, frequently exceeding 200 inches a year—upward of 22,000 tons of water per acre, or more than half a ton per square foot. Here there is plenty of water for use in flumes, big V-shaped troughs, miles long, carrying streams of water into which the cane is thrown and washed down to the mills (see page 167).

On the lee side of this island, however, and on all of the producing areas of the islands of Kauai, Oahu, and Maui—for the mountains come down to the coast on the windward side of the latter three and leave no room for cane fields there—the crop is produced entirely by irrigation.

Nowhere else can one find a better illustration of how the genius of man can transform adversity into advantage than in the story of Hawaiian sugar on Oahu, Maui, and Kauai, where, lacking water during the dry seasons, the planters dug irrigation ditches and impounded the excess waters of rainy periods, and now are able to grow more cane to the acre than the best naturally watered sugar lands in the world can produce.

Irrigated Maui Island produces approximately 15,000 pounds of sugar per acre year after year;* unirrigated Hawaii Island produces 8,000 pounds. Cuba produces during an average year 4,900 pounds per acre, and Louisiana 2,620 pounds.

Some of the irrigation systems of the larger plantations are of amazing proportions, well justifying the assertion that the Hawaiian plantation managers are "the most daring and successful land reclaimers in the world."

The first irrigation ditch in the Islands was dug in 1857. Now there are thousands of miles of ditches and hundreds of miles of tunnels carrying water to the cane.

In the island of Kauai two plantations under one management have forty miles

*A single acre under irrigation has produced as much as 10½ tons.

Photograph by W. K. Fisher

A STUDY OF FLIGHT, ON LAYSAN ISLAND, A TERN (*Sterna fuliginosa*) COLONY

of tunnels and ditches. Another plantation has one tunnel more than six miles long.

A plantation on the island of Oahu has an aqueduct nearly fifteen miles long, ten miles of which is tunnel. This aqueduct taps four valleys and in order to do so had to pierce the Koolau mountain range with a tunnel 14,443 feet long.

ONE PLANTATION USES AS MUCH WATER AS THE CITY OF SAN FRANCISCO

Vast reservoirs for impounding water are constructed in the mountains so as to maintain a constant supply, which, at times, reaches a total of 50,000,000 gallons a day. One plantation requires as much water to keep its cane growing as San Francisco requires for all purposes.

Much of the water for irrigation purposes must be pumped from artesian wells, of which there are thousands. Realizing that the water supply from these wells can be maintained only by retarding the flow of the mountain streams to the sea, extensive reforestation work has been undertaken.

It has been estimated that half a ton of water is required for each pound of sugar produced. On this basis the average American, consuming upward of eighty pounds of sugar a year, needs forty tons of water for his sweet tooth alone.

More water is required on Hawaiian sugar plantations than in Cuba, as the Cuban cane reaches maturity in twelve months, whereas Hawaiian cane needs seventeen months to be ready for the harvest. This partially compensates for Cuba's smaller production per acre.

Photograph by W. K. Fisher

ONE OF THE LARGE ALBATROSS COLONIES, MOSTLY YOUNG BIRDS, ON LAYSAN ISLAND, TERRITORY OF HAWAII

To this tiny island millions of albatross, plover, tern, and man-o-war birds journey annually to rear their young. Because of its remoteness from the mainland, 2,000 miles distant, this bird colony is considered the most remarkable known to science (see text, page 189).

By intelligent selection of cane varieties, each being grown in the soil shown by experimentation to be especially adapted to its development, the Islands have been able nearly to double Cuba's per-acre production of cane, and have also produced cane yielding 15 pounds more sugar to each ton.

The story of the sugar industry in Hawaii is one that varies radically from that of the Cuban industry in many of its details.

Much of Hawaii's crop, as previously stated, is produced on irrigated lands, while very little of Cuba's can be.

A considerable part of Hawaii's cane is transported to the mills by flumes, while none of Cuba's product travels in such fashion.

Hawaii makes extensive use of fertilizer; Cuba relies very largely on the natural productivity of the soil.

Cuba's production per acre of both cane and sugar seems large contrasted with most other sugar-producing regions of the world; but it seems small compared with Hawaii's yield.

THE BATTLE BETWEEN PLANTERS AND INSECT PESTS

There is no phase of Nature in Hawaii more dramatically interesting than the struggle between the sugar planters and the insect enemies of cane. In countries to which various forms of animal life are native there are always parasites which prey upon them and hold them in check. But introduced forms of life which find living conditions to their taste and natural enemies wanting, get a foothold and make a headway that is scientifically startling and economically dangerous.

Nowhere else in the world is that condition better exemplified than in Hawaii. With a climate ideally suited to the requirements of innumerable tropical and subtropical insects, and with food supplies luxuriant and perennial, when one of these species effects a landing as a stowaway from some other country, it promptly begins to spread and, without natural enemies to attack it, rapidly colonizes the country.

Typical among the stowaways that came to Hawaii in years gone by are the cane borers and the cane leaf hoppers. The borer is a beetle and the hopper a kind of plant louse. They effected their entrance on importations of cane seed and cuttings.

As years passed they both became so numerous that they threatened utterly to destroy the sugar industry of the Islands. With such a menace, the Hawaiian sugar planters organized an experiment station whose duties should include the discovery and importation of natural enemies of the borers and the hoppers.

How these enemies were found, colonized and set to work on the borers and hoppers is one of the remarkable romances of the sugar industry.

In 1906, Mr. F. Muir began a quest for the enemies of the stalk-riddling cane borer, whose evil disposition justifies its scientific name, *Rhabdocnemis obscurus.* First he went to China, but no borers were found. Then he visited the Federated Malay States, and from there journeyed to Java, but without success.

Discouraged, he was about to content himself with some cousin of the borer, ascertain its enemies, and import these into Hawaii, in the hope that they would attack the borer there as valiantly as they attack the borer's cousins elsewhere. But then he remembered that parasites are constant creatures, with their tastes running so much in a groove that they perish rather than change their habits even so slightly as a swapping of hosts might involve.

He therefore headed for Borneo, but neither in the field nor in the Sarawak Museum could the borer be found. He was about ready to admit that *obscurus* was a good name.

From Borneo Mr. Muir retraced his steps to Java, and thence shipped to the Molucca Islands. Visiting Amboina, of this group, he still found no trace of the borer, and the natives did not recognize the specimens he had brought from Hawaii.

THE BORER'S DEADLY ENEMY IS FINALLY FOUND

Again he set forth, proceeding to the island of Larat, via Kei and Aru Islands, and finally located borers not only in sugar cane, but also in pinang and sago palms.

Now that *obscurus* stood revealed, where were its parasites? He searched

Photograph by R. W. Perkins

A SIZABLE CATCH OF HAWAIIAN SHARKS

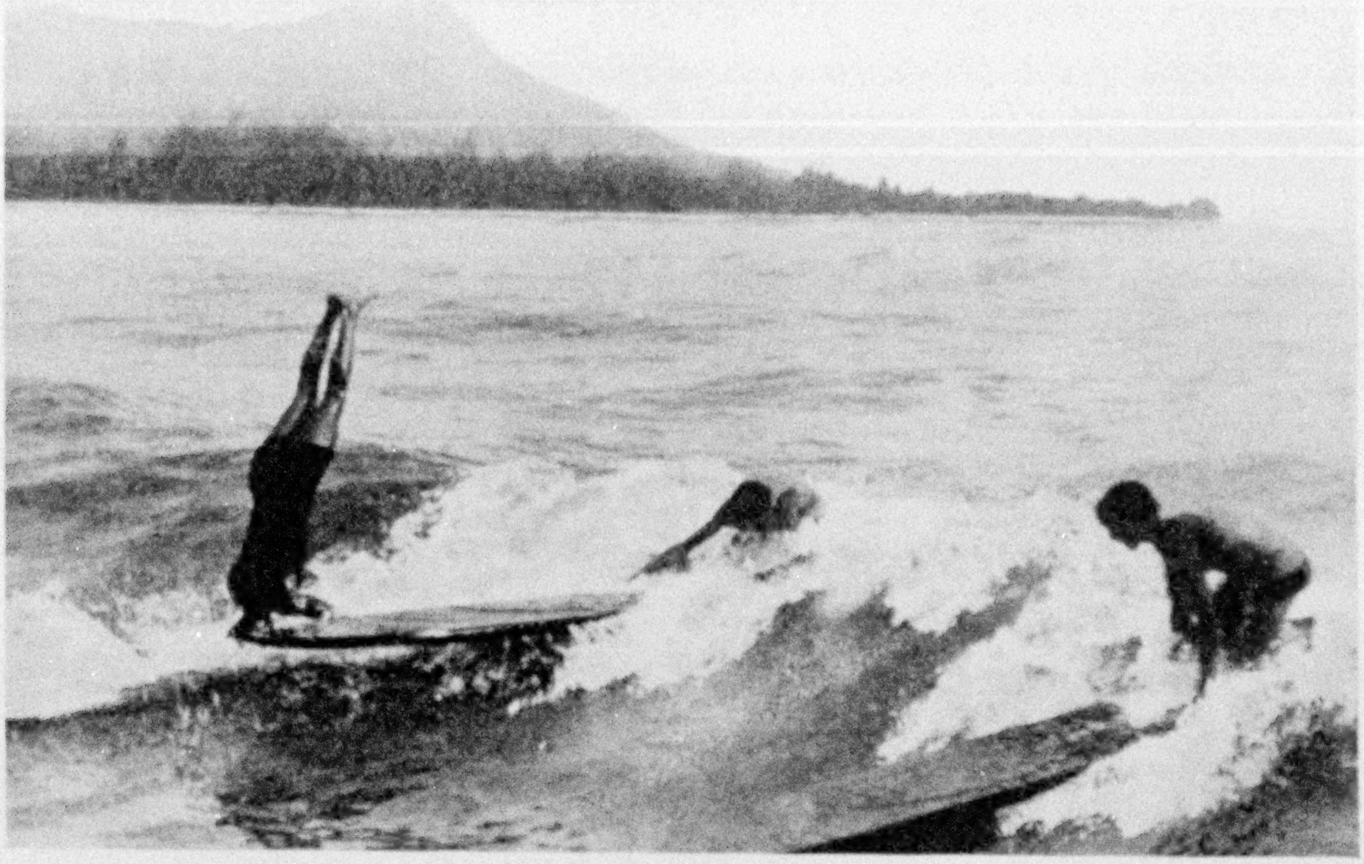
In ancient times, shark fishing was a royal sport, and it is said that the chiefs used human bait for their large bone and wooden hooks, which were sometimes more than a foot in length. Kamehameha I was especially proud of his title, The Great Shark Fisher.

high and low, far and wide; none was to be found.

Finally he seized upon a forlorn idea: If the borer lived in palms in Larat, might it not also have the same habitat in Amboina? Going back to that island, he found the surmise correct. The borer was abundant in the sago palm, and there he found it attacked by a little fly that laid its eggs in the borer's larvæ.

Here, then, was Hawaii's salvation from the borer if—if the friendly fly could be imported to the Islands. Repeated efforts to forward the flies and their pupæ failed—they always died before arrival in Honolulu. At last Mr. Muir decided to accompany a shipment himself, and journeyed safely with them to within a single day's sailing of Honolulu, only to have them die without apparent cause.

Back to the Moluccas he was forced to go again. Visiting Ceram Island, he found conditions about the same as in



SURF-RIDING: DIAMOND HEAD RISES IN THE DISTANCE

Few aquatic sports afford a thrill equal to that of surf-riding. The swimmer with his surfboard, from 7 to 12 feet in length and 1½ feet in width, works his way out through the shallow water over the fringing coral reef to where the high rollers rise. Selecting his wave, he gets his boat under way by paddling furiously with his hands and feet, and at the proper moment, mounting a high wave, throws himself on the board just as it is seized by the force of the onrushing water, which carries him with race-horse speed toward the beach.

Photograph by Henry W. Henshaw

HAULING IN A SEINE ON THE BEACH AT HILO

Photograph by Gilbert Grosvenor

APE-APE FOLIAGE IN PUOHOKAMOA GULCH: ISLAND OF MAUI

The plant with huge umbrella leaves is the Ape-ape (*Gunnera petaloides*) which millions of years ago flourished on all the continents. It grows to-day only in the Hawaiian Islands. The human figure gives an accurate conception of the size of this strange beautiful vegetation, for he stands in the same plane as the plants, which were growing on the slopes of the extinct volcano Haleakala, in a small gulch which had the hot, moist fragrance of a greenhouse. The photograph was taken from the cliff directly opposite while a light rain was falling (see pages 176-177).

Amboina, and then decided to go to New Guinea. At Port Moresby, on the latter island, he heard that the flies he sought were up Laroki River. He visited a camp 15 miles up the river and, finding them, stocked a number of cages with borer larvæ in which the parasitic fly had laid its eggs, and, though suffering from incipient typhoid fever, he set out via Brisbane, Australia, for Honolulu with his precious parasites.

But again fate was against him. At Brisbane he had to go to the hospital, after dispatching his flies unattended. They died long before their ship sighted the mid-Pacific's magnificent harbor.

Once more able to travel, Mr. Muir went to the Hawaiian mountains to recuperate, and then set out for Papua. This time he decided to establish two half-way breeding stations—one in Australia, and the other in the Fiji Islands. Arriving in Papua he collected more borer larvæ parasitized by the much desired fly, and in spite of an attack of malaria, he set out for Fiji. Here he had to go to the hospital again, but not until he had built a breeding cage for the flies.

At last he recovered, and with reinforcements brought by an associate, finally arrived in Honolulu with living flies on August 16, 1910, more than four years after starting on his quest.

Once safely in Hawaii, the flies began to spread with great rapidity and to work havoc among the borers, laying their eggs in vast numbers in the young of the borers.

So effective were these parasites that the borer has become a negligible factor in the cane-growing situation. The yield of sugar per ton of cane has gone up, the yield of cane per acre has increased, and a menace that threatened to overwhelm the industry has been thwarted. On one plantation the number of borer beetles collected declined in two years from 27,010 to 1,568.

Meanwhile, the borers becoming scarcer as a result of the attacks of the fly, the latter has also become scarcer because it has not learned how to gain a living off of any other kind of insect. But it ever stands guard against the borer, for just as soon as there is a new flare-up of borer activity, the flies begin to multiply again and continue to swell their armies until the borers have been duly subjugated.

An even greater menace to the sugar industry than the cane borer developed two decades ago when the leaf hoppers grew numerous. Any one familiar with the rose chafer and such small creatures of our dooryards knows the hopper type of insect. On a single infested sugar plantation production fell from 19,000 tons to 3,000 tons in three years. The hoppers punctured the stalks and leaves of the young cane and laid their eggs by the thousands in these punctures. Hatching out, the youngsters sucked the juices of the plant, thereby sapping its strength.

When the ravages became alarming, the entomologists of the Sugar Planters' Association were set to the task of finding where the hopper came from, and what its enemies were.

TINY ENEMY OF THE HOPPER FOUND

Finally it was ascertained that the pests had been imported as stowaways on seed cane brought from Australia. Going to the Library of the British Museum, in London, the entomologists found descriptions of the hopper and its native habitat, in Queensland, Australia. Visiting that country, they spent weeks hunting its natural enemies. One by one such enemies were discovered. One was an almost microscopic insect which, much as a mosquito attacks a human being, steals upon and attaches itself to the hopper's body, stinging it and laying a tiny egg beneath its skin. When this egg hatches the larva has such a tremendous appetite that by the time it is grown the hopper's interior department has been devoured and the parasite emerges ready to place its egg in some other animated combination incubator and larder.

The entomologists found another insect which, from the sugar growers' standpoint, has an even more successful plan of campaign against the hopper. It goes about seeking out hoppers' eggs in which to lay its own. Since its young hatch much more quickly than the hopper, they come to life in time to eat the hapless embryo hopper, and off of that feast to grow strong enough to lay eggs, in their turn, in the eggs of other hoppers.

Preyed upon by one class of enemies

that uses their live bodies first as incubators and then as restaurants, and by another class that uses their eggs as hatcheries and larders, the hoppers were forced to sound a retreat. Man had found irresistible allies, and so again the Hawaiian sugar industry was saved.

There is still another classic illustration in Hawaii of the incalculable value of the work of the entomologists to the human race. A wealthy Hawaiian visited Mexico, and found there a shrub which he greatly admired, and which he decided to take back to Honolulu with him. It was the lantana, growing some five feet tall, possessing a rich foliage, and bearing a brown, red and yellow flower. The slips grew wonderfully, and the shrub, away from its natural enemies, began to sweep over the island. Neither Canada thistle nor krautweed ever spread more like wildfire in a new environment than did the lantana. Pastures were ruined, and even the busy precincts of the cultivated fields were ruthlessly invaded by it. Again Hawaii went to her entomologists for relief.

Going to Mexico, the "bug specialist" visited the natural habitat of the lantana, and there found a fly whose special mission in life appears to be *to lay its eggs in the buds of the lantana. When these hatch out, the youngsters feast upon the lantana seeds.*

Brought to Hawaii, this fly, with no natural enemies, spread rapidly, and in a few years this Mexican shrub was relegated to the conquered dangers.

FRUIT FLY ATTACKS 72 KINDS OF HAWAIIAN FRUITS

Two other pests have been smuggled into Hawaii that are proving highly dangerous to the fruit and melon crops—the Mediterranean fruit fly and the melon fly.

The Mediterranean fruit fly is one of the most dangerous of all the fruit pests in tropical and semitropical countries. In Hawaii it attacks 72 different kinds of fruit. It obtained its first foothold in Honolulu in 1910, reaching Hawaii from the Mediterranean countries by way of Australia, and in four years had spread to every island of the group.

The method by which the fruit fly operates is for the female to drill little holes through the rind of a fruit and lay her eggs in them. The holes are so small that they escape observation, but in a few days the eggs hatch and the maggots, tiny things at first, begin to feed on the fruit. There is one fruit from which the fly derives no reward of posterity—the papaya, one of the commonest of the breakfast fruits of the Islands. It possesses such a rich supply of vegetable pepsin that it quickly digests the eggs of the fruit fly, thus preventing them from hatching.

There is no citrous fruit too acid for the appetite of the fruit fly's young, and lemons, grapefruits and limes are all "beer and skittles" to it. Four species of parasites that lay their eggs in the bodies of the fruit fly's larvæ, boring down through the rind of the fruit to reach them, have been imported from Africa and Australia.

The melon fly attacks melons in much the same way that the fruit fly plies its propagation practices. Its parasites have not yet been found, since the economic interests identified with melon growing have never been important enough to lead to the launching of a systematic campaign in quest of its natural enemies.

But both of these flies are potential stowaways to the United States, and the Department of Agriculture is sparing no effort to keep the quarantine bars so high that neither of them can effect a landing.

Yet the Department realizes that the danger is an ever present one, since there are always travelers who are either uninformed or careless, and who seek to conceal forbidden fruits about their persons or baggage. Some even send express packages whose contents are not truthfully stated.

The highest bars that a quarantine may raise cannot obviate the dangers of thoughtless or malicious introduction, and the Department appeals to every American to remember, when tempted to evade the law, the evils of the coddling moth and the English sparrow, and the browntail moth and the starling.

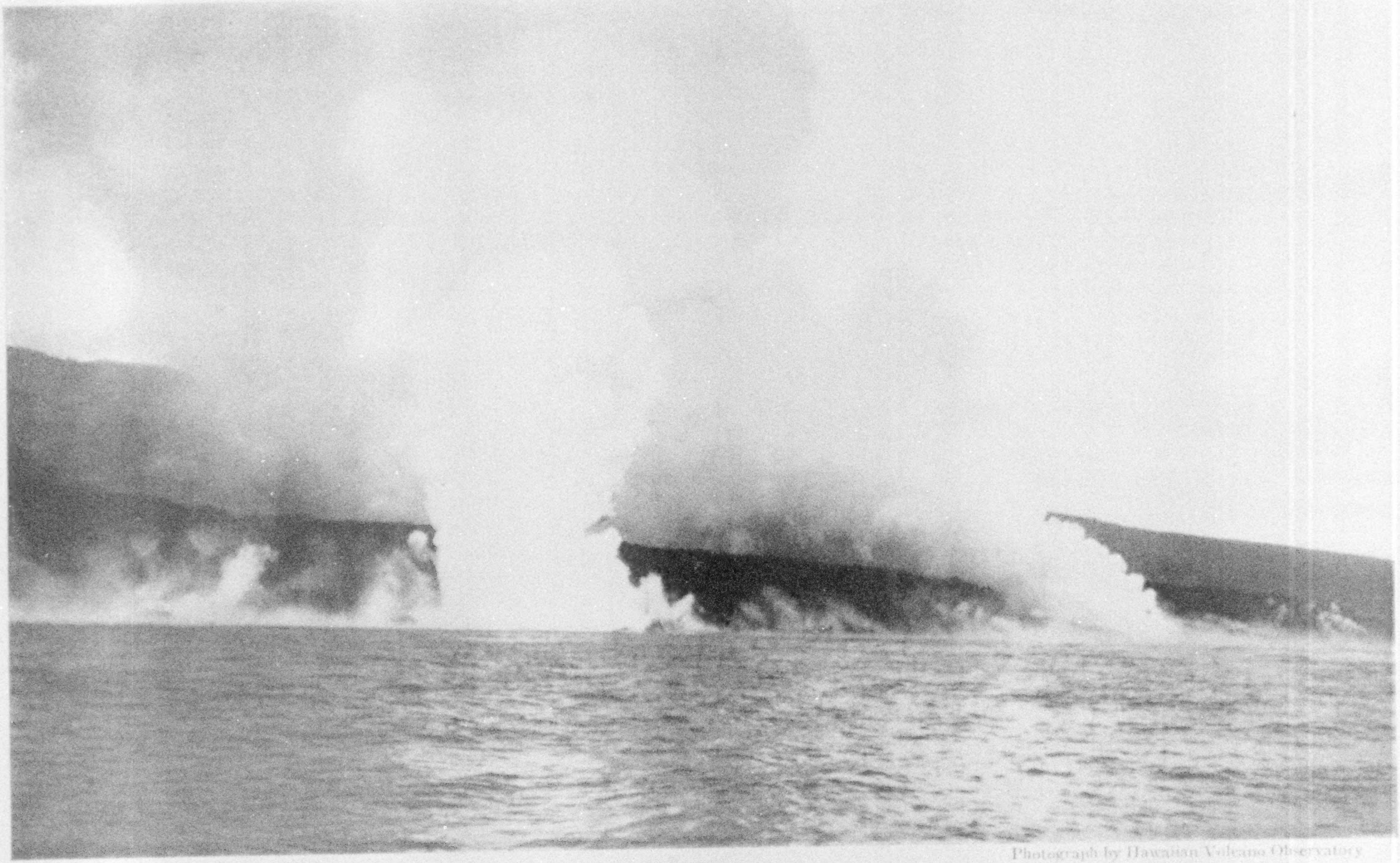
THE STORY OF THE PINEAPPLE IN HAWAII

We visited a pineapple cannery in Honolulu which employed 4,000 people, two-thirds of them women. Long trains of freight cars loaded with golden fruit were arriving every few minutes. The women were separated according to their

Photograph by Henry W. Henshaw

A HAWAIIAN LANDSCAPE

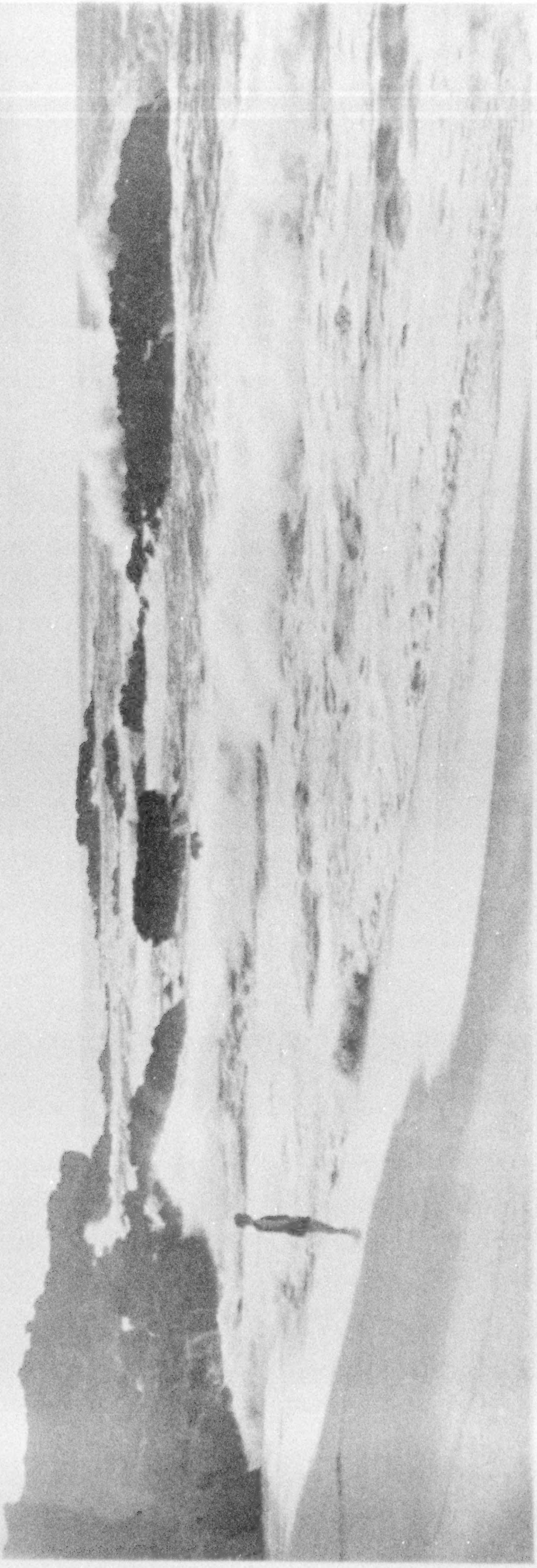
In the Hawaiian Islands to-day only fishermen when in action wear this abbreviated costume.



Photograph by Hawaiian Volcano Observatory

A RIVER OF MOLTEN LAVA FROM MAUNA LOA POURING INTO THE OCEAN

About 100 feet of land was built out where the ocean was formerly very deep. When this photograph was made boiled fish were still floating on the surface of the water, which was warmed for several miles.



Photograph by Lewis Edwin Capps

HEAVY SURF GIRDLES THE ISLANDS WITH PERPETUAL THUNDER: ON THE OAHU COAST

Photograph by Henry W. Henshaw

A SAILING DOUBLE CANOE SKIRTING THE SHORES OF COCONUT ISLAND NEAR HILO

Photograph by Henry W. Henshaw

AN AFTERNOON SHOWER: ON THE RIGHT A FIELD OF SUGAR CANE IN FLOWER: HILO

Photograph by Henry W. Henshaw

A GIANT TREE FERN ON THE ISLAND OF HAWAII

There are no less than 130 species of ferns, varying in height from a few inches to many feet, in the Hawaiian Islands. They form an especially luxuriant undergrowth in the ohia-lehua and koa forests. The koa is the famous "Hawaiian mahogany," from which the natives used to fashion their dugout canoes. On account of the isolation of the islands, the proportion of plants peculiar to the group is greater than in any other part of the world.

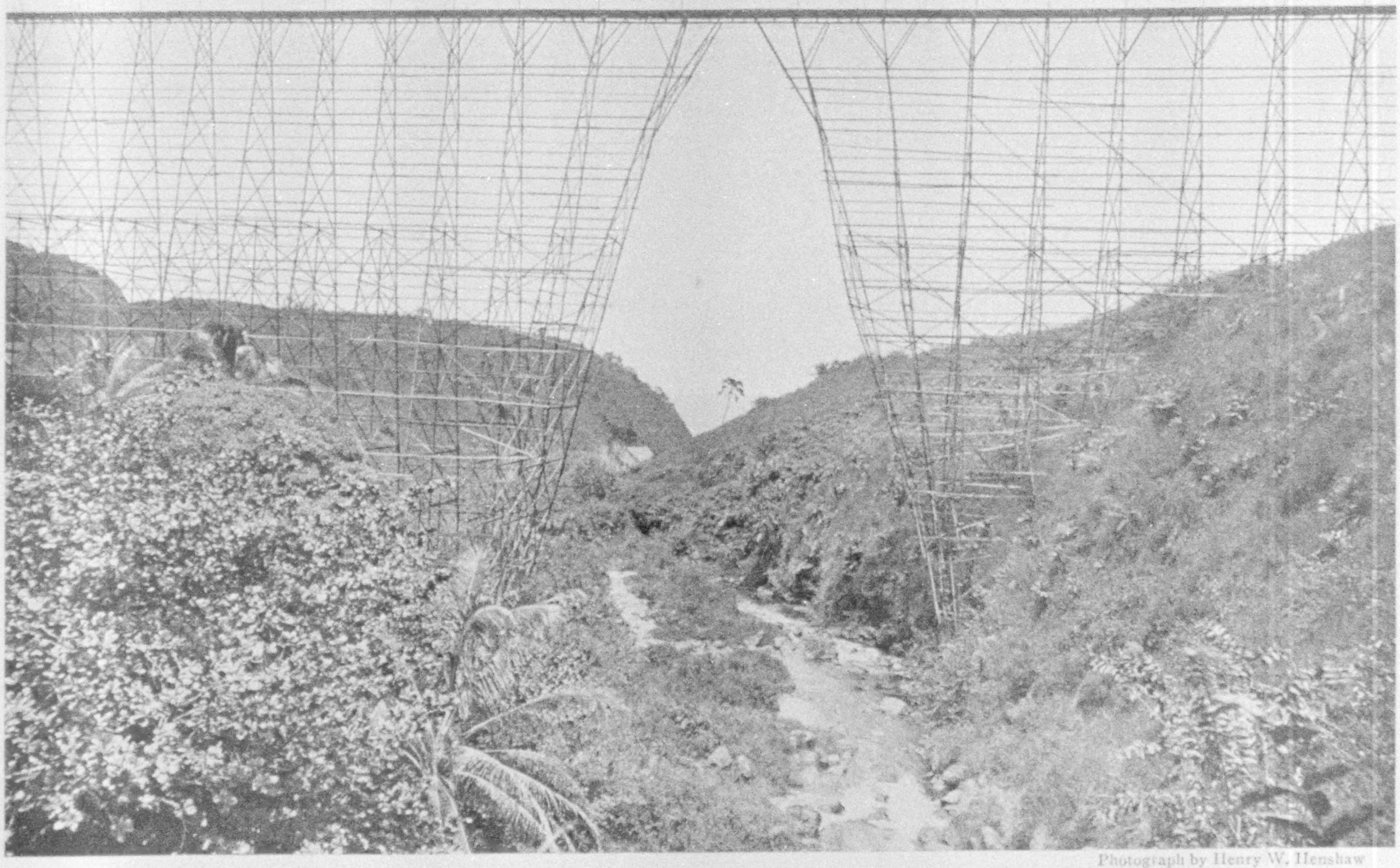
Photograph by Gilbert Grosvenor

THE ROADSTEAD AT LAHAINA: THE ISLAND OF MAUI

During the first half of the last century an American whaling fleet assembled here annually. The picture was taken from the terrace of the Manual Training School at Lahainaluna, one of the first manual training schools of the New World. It was on Maui that General Armstrong was born, and it was the success of this mission school in helping the native Hawaiians that inspired him to found the Hampton Institute for Negroes and American Indians.

Photograph by Henry W. Henshaw

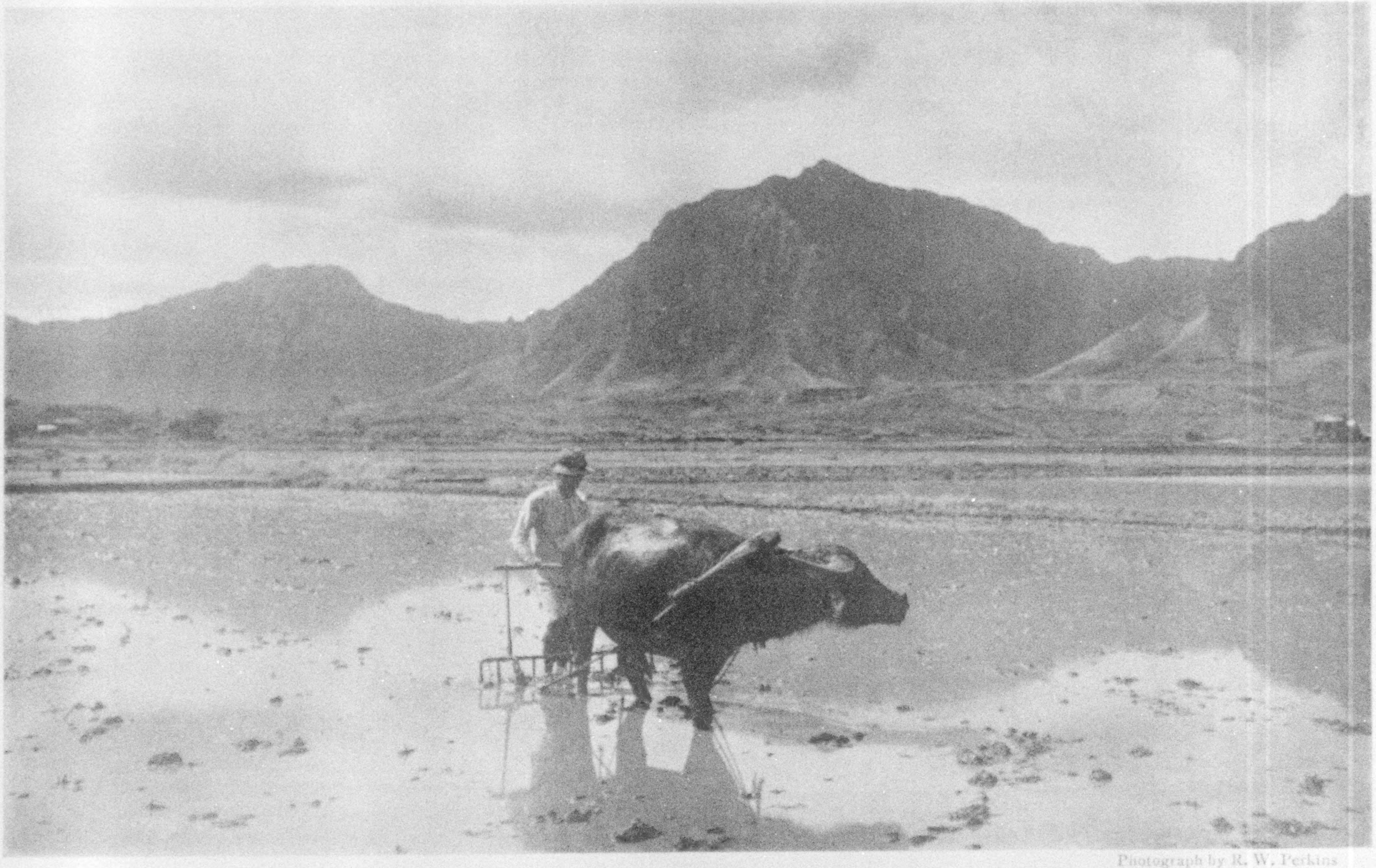
IN THE HARBOR OF HONOLULU



Photograph by Henry W. Henshaw

A SUGAR-CANE FLUME NORTH OF HILO

Aqueducts on trestles of wood convey the sugar cane from the fields to the mill where the cane is ground and the juice extracted.



Photograph by R. W. Perkins

PLOWING RICE FIELDS WITH WATER BUFFALO: OAHU

© R. J. Baker

CHILDREN CLOTHED IN NOTHING BUT SUNSHINE

Photograph by Joseph F. Rock

THE IMPOSING CLIFFS OF IAO VALLEY, ON THE ISLAND OF MAUI: THE DARK VERTICAL STREAKS BECOME WATERFALLS DURING RAINSTORMS

Behind the clouds is Mt. Kukui, which has a record of 562 inches of rainfall in one year. In the recesses of this beautiful valley, which resembles the Yosemite Valley of California, dead kings were concealed so that no commoner might steal their bones to make fish hooks.

Photograph by Gilbert Grosvenor

A CLIFF SIDE IN A LUXURIANT GLEN ON THE SLOPES OF HALEAKALA, MAUI

The human figure leaning against the cliff suggests the size of the giant umbrella leaves of the ape-ape and of the long graceful ferns (see also pages 156, 164, and 172).

Photograph by Alonzo Gartley

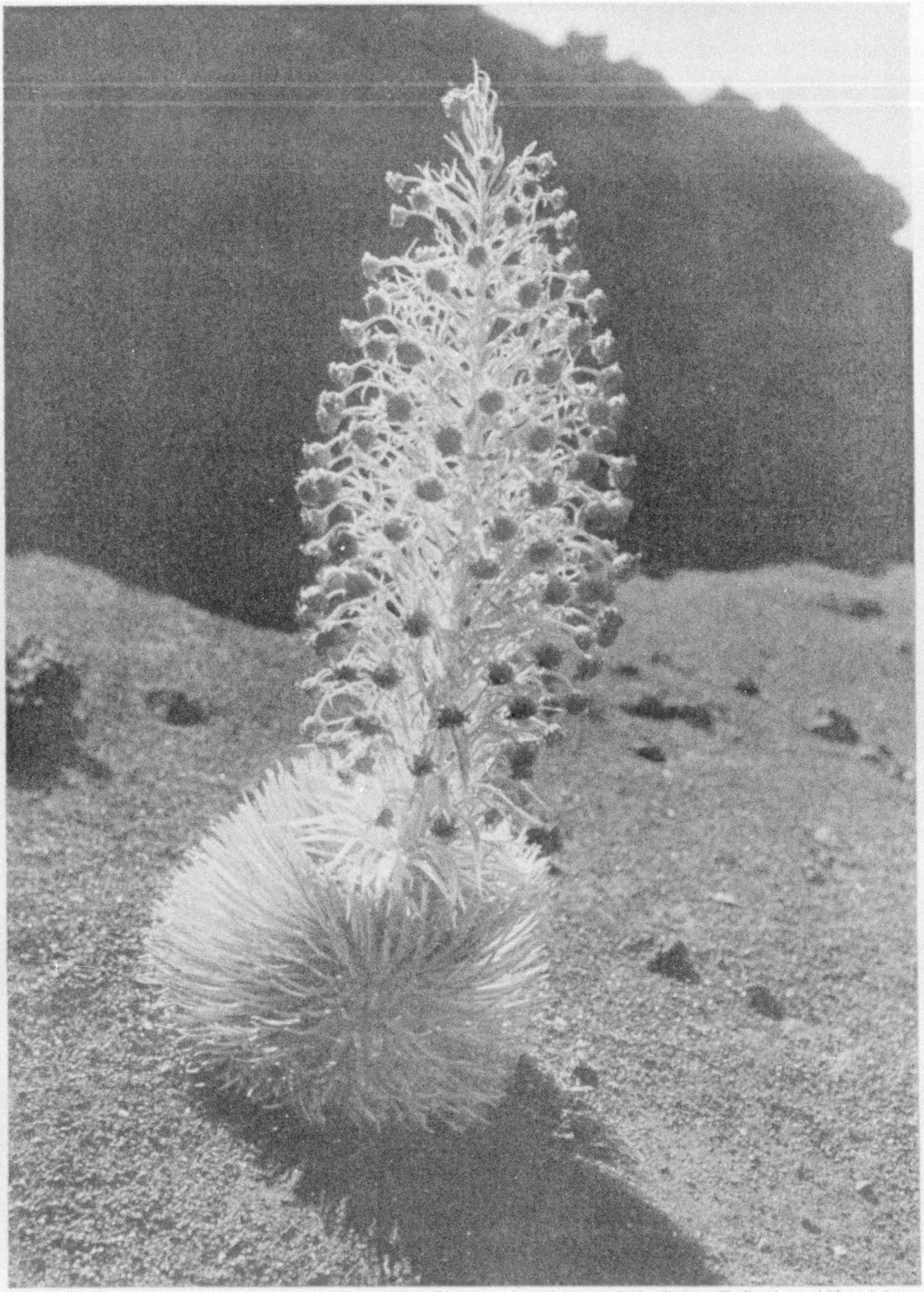
A GULCH IN KAUAI, HAWAIIAN ISLANDS

As a result of their isolation and their freedom from geological changes for thousands of centuries, the Hawaiian Islands have evolved a remarkable and virgin flora. Six hundred and fifty species found nowhere else in the world have developed in these islands. Kauai, being the oldest island, has the majority of these new varieties, and Hawaii, being the youngest island, has the least number.

Photograph by J. Senda

WAILUA FALLS, ON THE ISLAND OF KAUAI

The greatest rainfalls recorded by meteorologists have gouged deep canyons and ravines and gradually carved on the little island of Kauai a system of gorges unique on the face of the earth. Waimea Canyon (Color Plate II) is a miniature Grand Canyon, not so deep, but even more gorgeously colored. The color scheme is heightened by flocks of large white birds, with unusually long white tails, which are forked like swallows' tails, hovering against the bright red walls and deep indigo sky.



Photograph and copyright by Robert K. Bonine, of Honolulu

THE FAMOUS SILVER SWORD PLANT OF HALEAKALA, FOUND IN THE EXTINCT CRATER OF HALEAKALA, ON THE ISLAND OF MAUI

This specimen stands about five feet high; the leaves, three-cornered in shape, and the central stem are of a soft silvery gray, and the flowers are light yellow with brown centers. It was in former times quite plentiful in the crater, but of late years goats have been grazing here and they have despoiled many plants.

race: the Chinese at one set of tables, the Japanese at another, etc., and each group was striving to eclipse the record of the others. The fruit was not touched by the bare hand from the moment it left the train.

The story of the pineapple in Hawaii is one of the most fascinating horticultural romances of that romantic group of Islands. Once torn from the soil and cast upon a rubbish heap as less than worthless, its cultivation and canning to-day constitute the second industry of the Territory, the value of its crop being exceeded only by that of sugar cane.

The first pineapples in Hawaii were brought from the East Indies and were planted a few years ago on the island of Oahu. The failure of the venture was due not to the failure of the plant, but to its abundant success; the yield was so plentiful that the fresh-fruit market of Honolulu was soon flooded and the venturesome planters had to accept a heavy loss. Wisdom seemed to prompt the pioneers to uproot the plants and cast them like tares into the fire.

A few homesteaders, however, enamored of the flavor of the new fruit, rescued some of these uprooted pineapples and transplanted them to their own gardens. Again they bore wonderfully.

In time these new friends of the crop established a cannery for the surplus fruit and from this modest beginning has developed an industry which in 1923 shipped more than five million cases of canned fruit to the markets of the world.

The pineapple makes few demands upon the cultivator—a loose soil, a reasonable amount of moisture and, above all, good drainage.

Frequently, when a field is to be planted in pineapples, enormous ribbons of heavy paper are spread upon the ground in parallel lines, with only a narrow space between them. The young plants are set out in holes cut in the paper, which forms a tough coverlet, permitting them to grow sturdily, yet smothering any weeds which attempt to compete with them.

Wind and rain eventually destroy the paper, but not until the plants have established themselves and are in a flourishing condition. This novel method of planting is supposed to have increased the size of the pineapples one-fourth and to have added some eight tons to the acreage yield.

The fruit is protected by sharp, spiny leaves and the gatherer must wear heavy gloves and leggings to protect himself from the saw-tooth edges.

The "pines," as they are universally called in the Islands, are harvested ripe for canning. Machines have been devised which peel the skin from the barrel-shaped apple, carve out the core, and slice the tender fruit into golden disks.

The fruity cores are chopped into bits for the use of confectioners and the meat adhering to the skins is grated and canned, while the shreds are made into the syrup used in canning the choice disks. The skin refuse is taken back to the pineapple fields and converted into fertilizer—so that, like the pig in the packing-house, every part is utilized.

AN AMAZING MIXTURE OF RACES

Sugar has brought the Islands great wealth, but also the most complicated racial mixtures and problems to be found anywhere in the world.

A visitor to Hawaii in pre-annexation days, before the huge influx of orientals to work the plantations, gives many amusing illustrations of the simple family arrangements of that earlier time.*

"I remonstrated with my sister as to the familiarity of her men servants, but she told me it was the custom of the natives; she had tried to make them say 'Mr.' and 'Mrs.,' but they replied, 'No, no; too many Smith, too many Judd; you John and Lizzie.' One foreign lady, newly arrived, had declared that her servants should never be allowed to address her in so familiar a fashion, and she instructed her husband—she was a bride—never to mention her Christian name in their hearing. One day she had some visitors, and, to their great edification, the cook put his brown head inside the parlor door and asked, 'My love, what vegetable you want to-day?' After that she was content to be simply 'Mary.'"

But the easy ways of that generation were ended by the coming of many thousands of Chinese, Portuguese, Japanese, Koreans, and Filipinos.

* "The Story of Hawaii," by Owen.

Photograph by Joseph F. Rock

THE "FIG LEAF" OF HAWAII: THE APE-APE (SEE PAGES 156 AND 171)

The present population is approximately 41.7 per cent Japanese, 8.6 Chinese, 8.4 Filipino, 14.8 Hawaiian and semi-Hawaiian, 12.4 Latin, which is mainly Portuguese, and 11.8 American, British, Germans, etc. (see diagram, page 139).

Since 1914 the death rate of the pure Hawaiian has exceeded the birth rate, and it is a question of only a few years before this fine old race becomes extinct, except as a mixture with other races.

In recent years increasing numbers of Filipinos have been attracted to the Territory by the big wages paid by the plantations. Among the best of these workers are the Ilocanos, who bring their love of cock-fighting with them. Each Ilocano keeps a pet blooded gamecock, which he grooms and treasures as jealously as any society matron her pet lapdog, and probably the gamecock cost him as fancy a price. When he goes to work he locks his pet in his room as carefully as the housewife locks up her silver, and he lavishes more on his champion's food than on his own.

PICTURE BRIDES

The Japanese long since wisely decided that they would not intermarry with other races; the children of the marriage of a Japanese with a Hawaiian, or with a white, being, in their judgment, inferior to either of the parents.

So when a young Japanese desires a wife and cannot find in Hawaii a girl pleasing to him or willing to marry him, he writes to his relatives in Japan to select a mate for him. Photographs are exchanged and the girl marries him by proxy in Japan, and then starts on the long voyage to Hawaii, where a second ceremony completes the contract. Eleven thousand Japanese in Hawaii have obtained Picture Brides in this romantic method.

A survey of education in Hawaii made under the direction of the U. S. Commissioner of Education in 1919 says:

"With respect to birth and death rates, the Japanese is the most favored race of the Islands, having, among all the races, made the best adjustment to all those conditions affecting race multiplication. . . .

"The Japanese are ambitious to become tenants, to own land, to set up a business, to enter a profession, to rise above the category of unskilled labor, and, as they

individually achieve their ambition, they are, like the Portuguese, participating more and more in the affairs of the Islands, socially, educationally, politically.

"Furthermore, they are all at work; there are few triflers and idlers among them. . . . Their per capita savings bank deposits rank third among those of the island races, being exceeded by the American and Portuguese only. . . .

"All of which can be explained adequately on the basis of the racial qualities inherent in the Japanese, of patience, persistence, thrift, initiative, endurance, ambition, group solidarity, coupled with acumen and astuteness. This group will soon have a majority of the voters of the Islands.

"The fourteenth amendment to the Constitution of the United States declares that every child born within the jurisdiction of the United States is a citizen of the United States. . . . By 1940 about 47 per cent of the electorate may be expected to be composed of voters of this race.

"Whether or not the Japanese desire to achieve political control, without doubt within a few years they will be in a position to do so if they choose." *

The racial situation has been much complicated by foreign-language schools, in which many of the young Japanese have received exclusively Japanese instruction.

Photograph by Joseph F. Rock

THE FLOWERS AND FRUITING SPIKES OF THE APE-APE

The leaves are not peltate but reniform. In the rain forest along gulches and waterfalls, East Maui, Mt. Haleakala, 4,000-4,500 feet elevation.

AT A NORMAL-SCHOOL DANCE IN HONOLULU

We attended a dance given to the graduating class of the normal school in Honolulu. To us visitors it was a very inspiring example of the beneficial influence of the American public-school system. The bright faces of the decorous

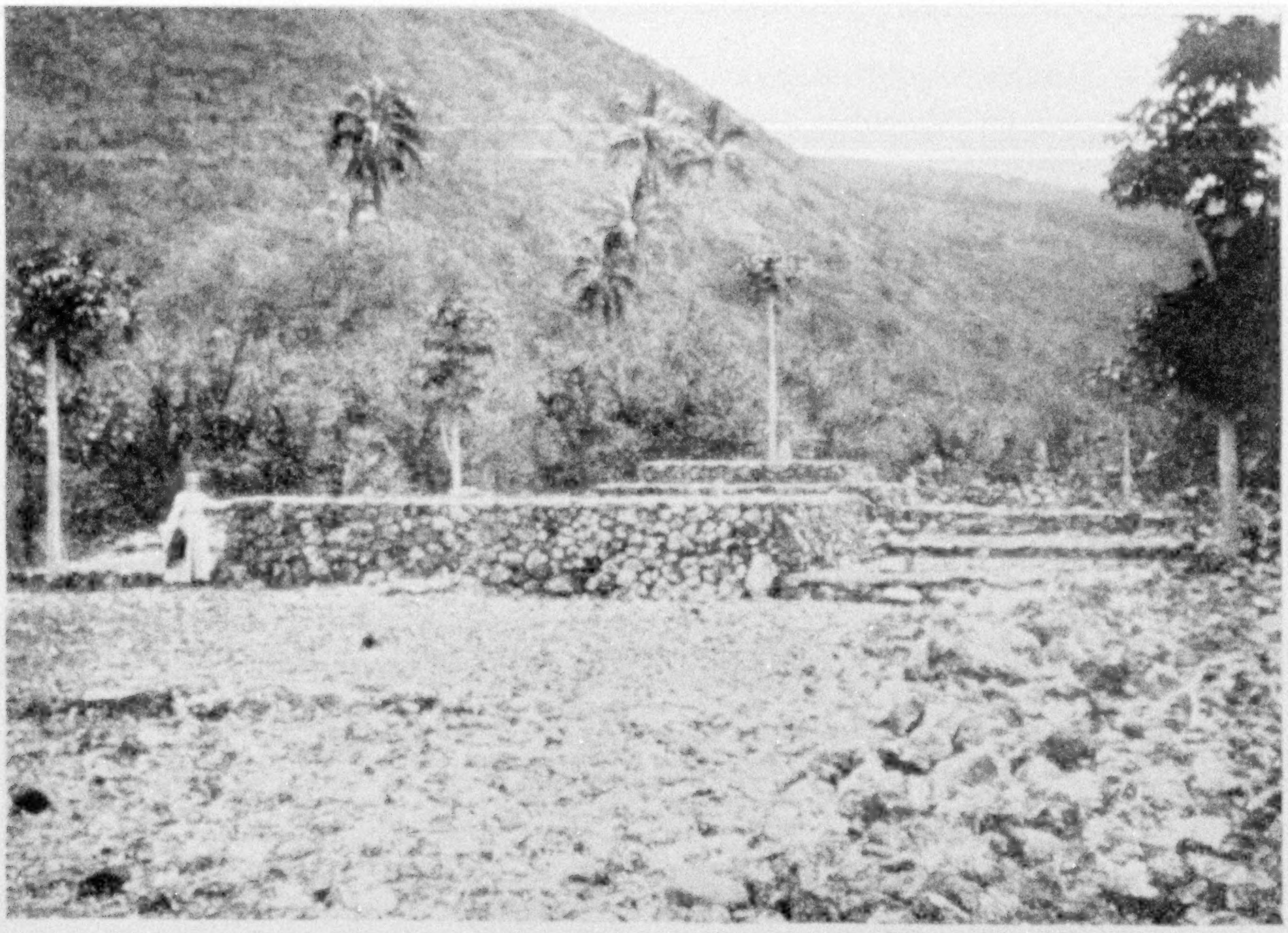
* "A Survey of Education in Hawaii," made under the direction of the Commissioner of Education, by Frank F. Bunker, W. W. Kemp, Parke R. Kolbe, and George R. Twiss.

THE RUNNING APPROACH TO THE ANCIENT TOBOGGAN SLIDE SHOWN IN THE PICTURE BELOW

Photographs by Dr. Albert S. Baker

AN ANCIENT TOBOGGAN SLIDE ON THE ISLAND OF HAWAII

Some of these slides were more than a mile long. They were built by the kings, who coasted down on sleds, the slide being covered with dry grass and made slippery with kukui-nut oil.



Photograph by Dr. Albert S. Baker

THE TEMPLE SITE AT NAPOOPOO, HAWAII, WHERE CAPTAIN COOK WAS GIVEN QUARTERS AND WORSHIPED AS A GOD BY THE HAWAIIANS

Only a few yards away he was later killed when the natives, incensed by the harsh conduct of his associates, learned that white men were mortal.

boys and girls revealed as many racial mixtures as the much-discussed photograph on page 136.

We admired especially a young Chinese couple and presently were so fortunate as to be able to converse with them. Both were born in the Territory of Hawaii of Chinese immigrants. She had graduated from the normal school in Honolulu and held a secretarial position in the U. S. customs, the first woman oriental to be employed by the Government, according to her escort.

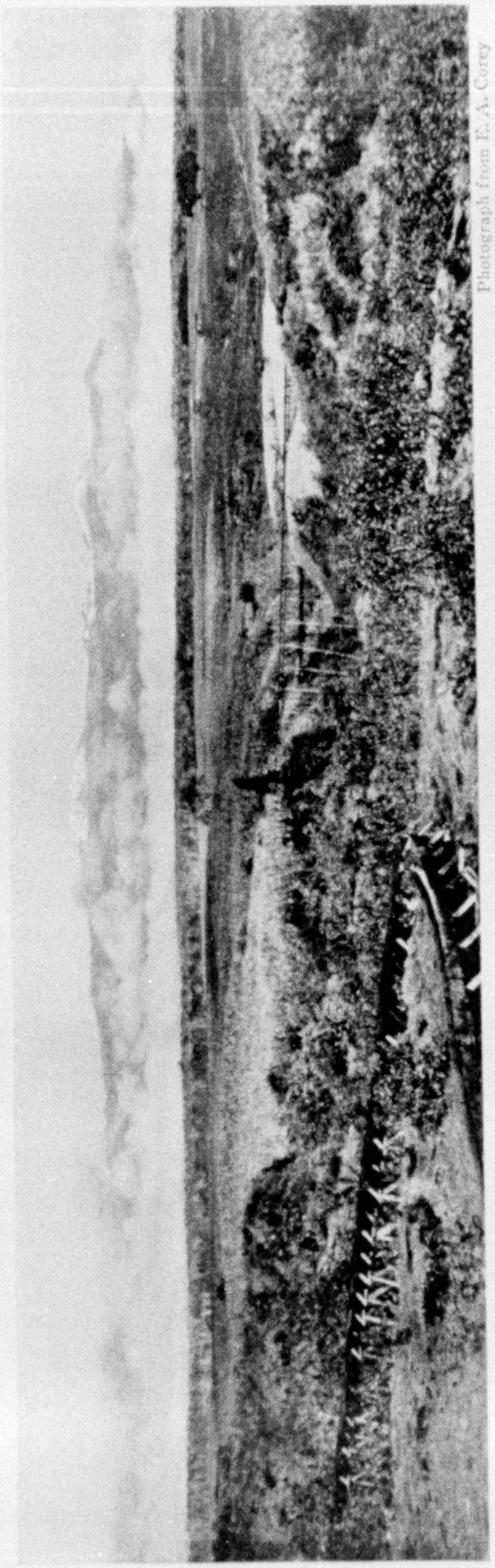
The eyes of the young man glowed and his chest bulged with pride when he announced that he was an American citizen. He had been to the mainland, as they describe America in Hawaii, for all islanders claim the group to be a part of America, and had studied at the University of Kansas. He asked me to name three of our greatest American college presidents. With considerable hesitation, I volunteered three names. He recognized each instantly, and placed each man correctly.

We also attended an illustrated lecture given for the benefit of the Red Cross by Ex-Governor George R. Carter in a country school house, on the island of Hawaii. Just as one would expect under similar conditions in the United States, the first two rows of benches were packed tight with jolly, mischievous boys of 8 to 12 years of age, but of all racial mixtures. One boy had an expensive electric pocket flash light and, to the admiration and delight of his fellows, occasionally flashed it during the proceedings.

THE GEOGRAPHICAL KEY TO THE PACIFIC

A glance at the map on page 116 will remind the reader of the geographical importance of the Islands. They command every trade route of consequence to China and the Orient across the Pacific. The Islands are in fact the key to the Pacific, a lonely American sentinel on guard for American interests.

Their strategic importance to the United States has been vastly increased by the recent extraordinary improvement of airplanes and airships.



Photograph from E. A. Corey

A PANORAMA OF A SUGAR PLANTATION, SHOWING ON THE LEFT A FLUME IN WHICH SUGAR CANE IS CARRIED BY WATER TO THE MILL WHICH EXTRACTS THE JUICE AND MAKES THE RAW SUGAR

Without reflecting on the oriental elements so predominant numerically in the population of the Islands, I venture to think that it must be apparent to all Americans that the racial situation is so complicated and so uncertain that every military and educational protection should be taken to insure that these Islands, which are so American in tradition and so essential to our safety, remain permanently in our possession.

It would be difficult to overestimate the strategic value of the Territory of Hawaii in the protection of our Western Coast from invasion.

Happily, the treaties drawn by the Washington Conference on the Limitation of Armaments have been ratified by the United States and Japan and the prospect of a war between them we sincerely hope has disappeared.

Before this conference, however, the distrust of each of these countries was plainly leading them toward a struggle which neither of them desired and both of them dreaded; but none the less a struggle for which each felt it must be prepared.

A STRATEGIC STRONGHOLD OF DEFENSE, NOT OFFENSE

The military and naval authorities of the United States had made a careful study of the course such a war would take and of the rôle Hawaii would play.

With an adequate naval base at Pearl Harbor, and the American fleet stationed there, Japan could not make a dangerous assault upon the mainland coast or the Panama Canal. For her navy would have to come nearly six thousand miles from its base, and face the prospect of a stronger fleet between it and home.

On the other hand, Hawaii could not be used as a base of direct attack against Japan by the United States. The distance from Honolulu to Yokohama is 3,400 miles—

Photograph by Herbert B. Turner

RICE FIELDS OF HANAPEPE VALLEY ON KAUAI, THE GARDEN ISLAND

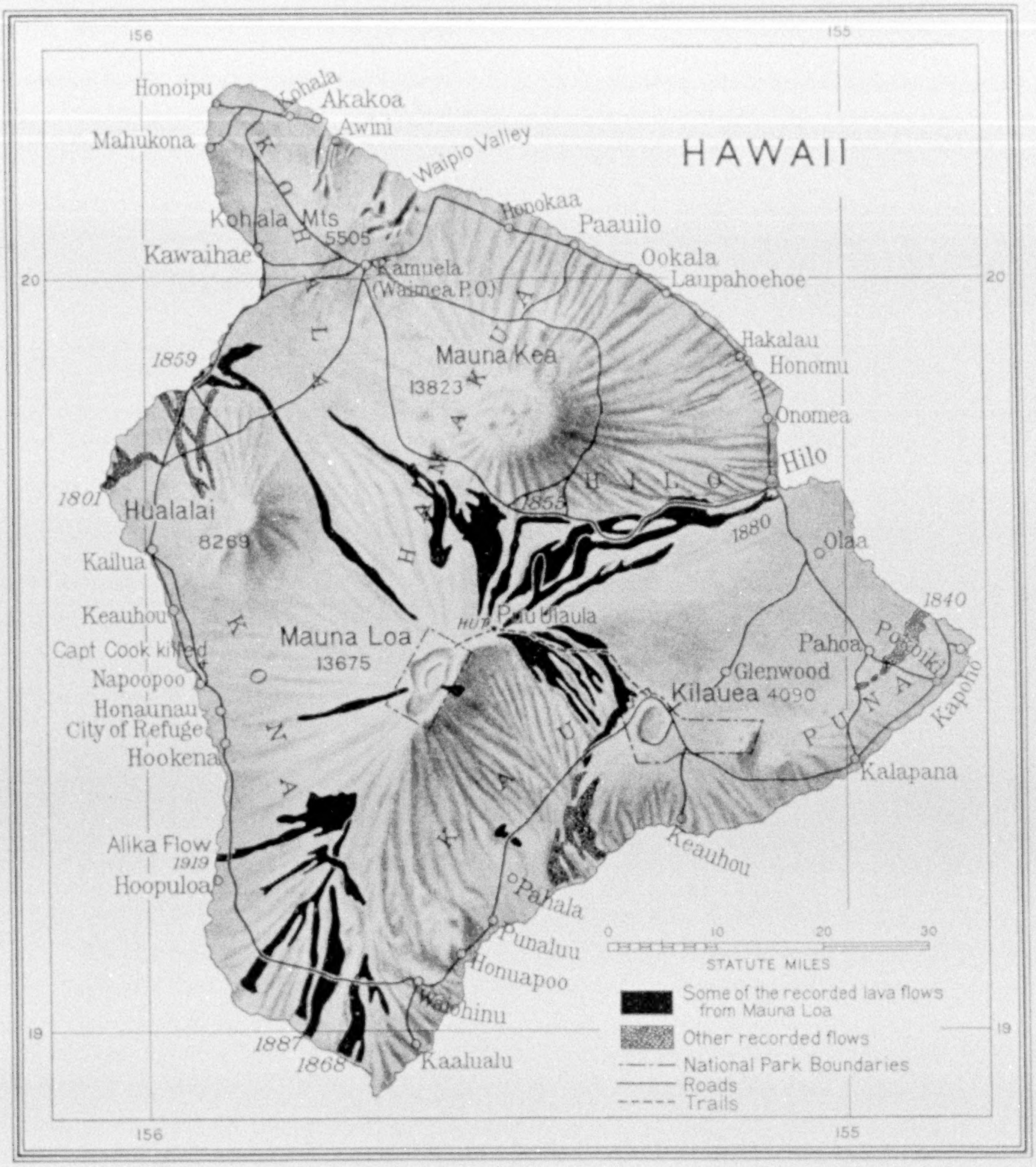
Photograph by Hawaiian Volcano Observatory

A REMARKABLE NIGHT PHOTOGRAPH, SHOWING THE VOLCANOES OF MAUNA LOA AND KILAUEA IN ERUPTION AT THE SAME TIME

The picture was taken after midnight in a 25-minute exposure. Moon on the left. Kilauea lava pit below. Mauna Loa above. The fountains of fire on Mauna Loa are 400-500 feet high. The band of light on Mauna Loa is two miles across.

Photograph by Gilbert Grosvenor

THE RESTHOUSE 10,000 FEET UP MAUNA LOA, IN WHICH TRAVELERS CAN FIND COMFORTABLE BUNKS FOR THE NIGHT



Drawn by A. H. Bumstead

A MAP OF THE ISLAND OF HAWAII, SHOWING THE FOUR VOLCANOES, MAUNA KEA, HUALALAI, MAUNA LOA, AND KILAUEA, WHICH HAVE CREATED THE ISLAND

The map also shows the principal lava flows of recent years. The outpourings from Mauna Loa extend like the arms of an octopus across the entire island (see text, page 237).

so far that even a 5 to 3 navy could not hope to hold the advantage over its less numerous antagonist. The naval authorities of both countries recognize this.

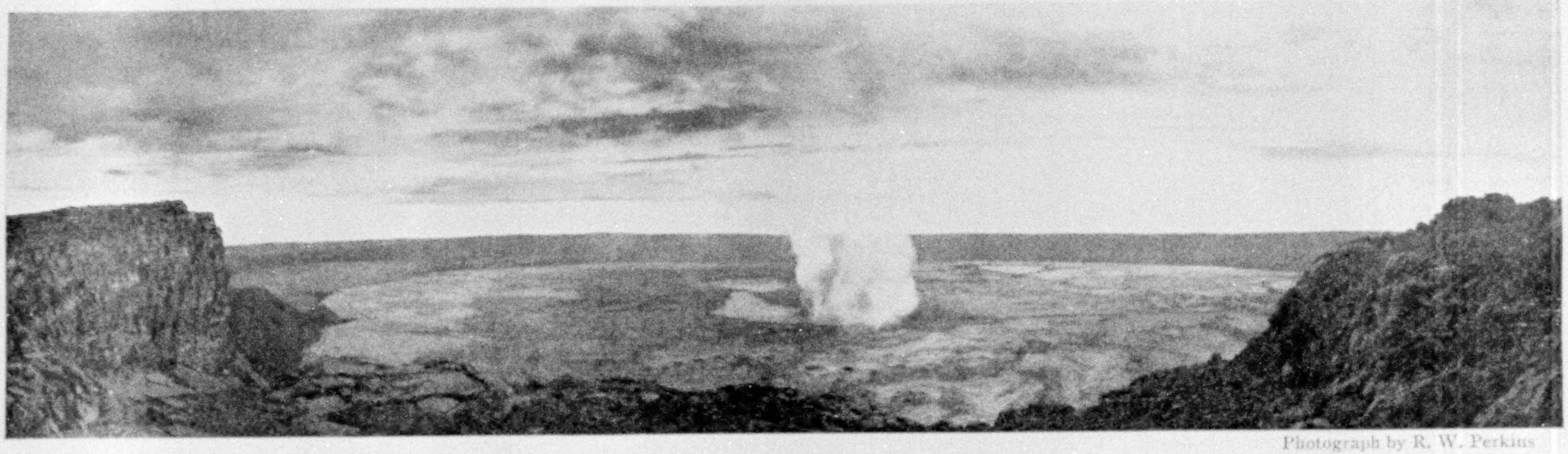
So far from our continental coasts, then, as to be an effective and specific guarantee against attack from the Orient, and at the same time so remote from the Asiatic shores as not to menace them, Hawaii serves an admirable rôle strategically, so long as it is held by our forces, being the impregnable outer defense of our coast line and at the same time not a peace-time menace to any possible enemy.

In outlining the probable course that a war between the United States and Japan would have taken, military and naval authorities believed it would have started with the conquest of Guam by Japan. From there, or simultaneously, the Philippines would have been attacked and must have fallen easy prey.

After that Japan might have settled down to await our attempt at retaking

Photograph by Joseph F. Rock

SUMMIT OF MAUNA LOA (13,675 FEET) ABOVE THE CLOUDS, AS SEEN FROM NEAR THE SUMMIT OF MAUNA KEA (13,823 FEET)



Photograph by R. W. Perkins

A PANORAMA OF THE CRATER OF KILAUEA, SHOWING THE FIERY PIT, OR "HOUSE OF EVERLASTING FIRE" (HALEMAUMAU), IN THE CENTER (SEE COLOR PLATES IV, V, AND VII)

An excellent automobile road approaches close to the rim of the pit.

these possessions, and therein she would have had as much advantage as we would have had should she have attacked our continental territory.

To be assured of holding the Philippines in case of a war with Japan, we would have had to fortify Guam and to make a major naval station there. Yet such a station would menace Japan as much as it would protect the Philippines. It was this knowledge that caused Japanese statesmen to object to the proposed naval base at Guam.

PEARL HARBOR ONE OF THE WORLD'S FINEST NAVAL BASES

Under the naval treaty the naval base at Guam will not be built, and that menace to Japan will disappear. At the same time the treaty leaves both countries free to go as far as they like, the one at Taiwan (Formosa) and the other at Honolulu—each perfecting its powers of defense, but neither increasing its powers of offense against the other's mainland.

Pearl Harbor, which is located some eight miles from Honolulu, is one of the finest natural naval bases in the world. With a depth of over sixty feet, an area of nearly ten square miles, reached by a tortuous channel from the sea, and completely hiding all vessels within its haven from view toward the sea, it leaves nothing to be desired as a natural naval base.

No landing forces on the northeast coast can get across the high mountains of Koolau range, and likewise the Waianae mountains adjacent to the west coast are natural defenses against attack. It remains only, therefore, to defend a short stretch of the northeast coast to protect Pearl Harbor from the rear.

A start has been made in capitalizing its natural strength. A huge dry dock, large enough to float any ship sanctioned by the naval treaty, is in operation, but very little else has been accomplished to insure our permanent possession of this strategic point.

It is both impossible and unnecessary to fortify all the Hawaiian islands—impossible because of their great length of shore line and the wide sea area they cover, and unnecessary because there are no other Hawaiian harbors that would give a hostile navy a foothold from which to defy our fleet.

But the Territory of Hawaii is valuable strategically not only from a military and naval standpoint. It is equally important as an outpost against oriental diseases, many of which would get a foothold on our shores except for the watchfulness of our quarantine officials.

Most of the passengers who travel from the eastern coast of Asia to the west coast of America take passage on ships stopping at Honolulu, where ship and passenger inspection are required before landing privileges can be extended or clearance papers made out. This inspection, after 4,500 knots at sea, reveals the health status on board, and thus Hawaii becomes the health sentinel of America.

Hawaii is also placed strategically in the crossroads of Pacific commerce. Honolulu is the transfer point for the freights of five continents, and the majority of the trans-Pacific lines make it a port of call.

EACH ISLAND OF THE GROUP HAS ITS DISTINCTIVE APPEAL

The visitor to the Territory is continually astonished at the variety and magnificence of scenery afforded by the different islands.

Kauai, called the Garden Island because of the luxuriance of its vegetation, possesses a series of canyons that are remarkable in their splendor of color (see pages 172 and 181, Color Plates II and XIV).

Oahu's loveliness of mountain and forest is supplemented in interest by the many manifestations of the enterprise and inventiveness of the ambitious Americans, which, evident in each of the inhabited islands, are especially impressive here.

The little double island of Maui contains the greatest extinct volcano in the world, Haleakala (see pages 128 and 146-7, Color Plates VIII and IX), gulches overgrown with weird plants (see pages 156 and 171), a canyon known as the Iao Valley (page 170), which is very reminiscent of our magnificent Yosemite, and sea drives that in color of cliffs and dazzling waters remind one of the Amalfi coast of Italy.

The largest island, Hawaii, has the distinction of possessing the only active volcanoes of the group—the red lake of Kilauea, easily accessible by automobile

Photograph by Hawaiian Volcano Observatory

THE BOILING LAVA HAS OVERFLOWED AND BLOCKED THE ROAD NEAR THE FIERY PIT, THE WALLS OF WHICH MAY BE DISCERNED IN THE DISTANCE: KILAUEA

Photograph by Hawaiian Volcano Observatory

A PARTY OF TOURISTS EXAMINING A RECENT MILD OVERFLOW FROM THE BOILING LAKE, WHICH IN ITS METALLIC LUSTER RESEMBLES A VAST BED OF COAL

While still warm, it is perfectly safe to traverse.

Photograph by Gilbert Grosvenor

TRAVERSING THE DESERT OF AA LAVA WHICH COVERS THE UPPER SLOPES OF LOA AND RESEMBLES A LIMITLESS SLAG HEAP

In the distance the fume cloud from Kilauea Volcano may be seen. Kilauea is a great pit on a rolling plain; it has not the slightest resemblance to a mountain. Great clouds of sulphurous vapor roll incessantly upward from the pit. As twilight deepened into the darkness of night, the column of cloud glowed from the furnace beneath like a great pillar of fire (see pages 184, 186, and 187).

road to its brink, and Mauna Loa, the world's greatest active volcano.

The naturalist and student can find occupation and enjoyment for a lifetime in investigating and collecting land shells (see Color Plate XII), the incomparable wealth of endemic plants, and Hawaiian folklore.

The tiny islands at the extreme western end of the Territory form the Hawaiian Bird Reservation. Of these Laysan supports the most interesting bird colony in the world (see pages 123, 151, and 152).

To this bit of sandy beach, scarcely two and one-half miles long and one mile wide, millions of birds of many species resort every winter season. So crowded are they that some find it necessary to burrow underground to find a place to lay their eggs.

When we think of the long journey that these birds make twice each year over the three thousand miles of ocean without a rest, the wonder is that they do not perish on the way.

* "Just why the plover and all the other migratory birds undertake these wearisome flights across the wild open ocean it seems must ever remain a mystery. Without doubt, when storms are encountered many must lose their way and go down to watery graves, or, thrown from their course, must fly for days over the great dull expanse in search of land. Perhaps it was in some such accidental way that the first plover happened to visit Hawaii in the long ago.

OLD "STUMP-LEG"

"It is interesting to know that once the journey is successfully made, barring accident, the voyager is able ever afterwards to make the passage with unerring accuracy. An interesting case in point is the record I secured from Mr. Max Schlemmer, who for several years was the manager of the colony of laborers formerly stationed on Laysan.

"On one occasion a fine male bird, that was in the habit of roosting every night on a little mound of sand a few rods from the door of the manager's house, attracted his attention as it fluttered about on the sand apparently unable to fly.

"Picking it up, it was found that it had broken its leg and was in a pitiable condition. The manager amputated the leg at the fracture and set the bird at liberty. To the surprise of all, it healed perfectly.

"The stump-leg furnished a mark for identification that served to distinguish the bird from its fellows, and it naturally became an object of interest in the colony. It remained about the island all winter, returning each night to its favorite roosting-place on the sand mound. It became unusually tame and fearless.

"When spring came, however, it responded to the most powerful call that stirs the avian brain, the homing instinct, and with its fellows left the wave-washed shores of Laysan to make the long flight back from whence they came, seemingly for no more intelligible reason than that they had made the journey before.

"Naturally, the manager bade good-by forever, as he thought, to his bird neighbor the first night it failed to return to its roost. But, being a seafaring man, and accustomed to the excellent discipline of keeping a ship's log-book, whether on land or sea, he accordingly made a note of the fact with day and date and dismissed the incident from his mind.

"The summer passed, and one early autumn day the whole colony was thrown into a state of excitement by the announcement that the stump-leg plover had returned the night before and had been found that morning occupying his sand-pile roost. The bird was apparently as much at home as though a summer cruise to some distant land was a regular occurrence and a matter of little consequence.

"Naturally, so important an event as the return of the stump-leg plover to its winter home was made a matter of record in the log for the day.

"The bird more than ever became the object of interest and concern on the part of all hands, for had he not accomplished a feat entitling him to the highest respect among seafaring men? Had not this bird, without a chart or compass, started from a given point in the very middle of the Pacific Ocean, and made a cruise extending over several months, and at least 6,000 miles of trackless water, returned again, arriving by night at the very point of starting? Certainly old 'Stump-leg'

* From "Natural History of Hawaii," by William Alanson Bryan.

was an able seaman and a master navigator.

"But this remarkable record does not stop with the report of the single trip. The log-book records that, for five years, each fall this bird returned to Laysan, arriving each year at almost the same date and departing in the spring with equal punctuality for parts unknown.

"But, at last, 'Stump-leg' failed to return. Whether he was killed by hunters in Alaska or gave out on the weary and dangerous journey, or lost his bearing and went down struggling against fate, or died a natural death, will never be known; but certain it is that his voyage to and from Laysan Island and the records made of them constitute a most interesting and valuable incident, throwing much light on the unerring accuracy of the mysterious instinct which, doubtless through hundreds and perhaps thousands of generations, has served to guide our feathered friends in their migrations to and from Hawaii."

All the larger islands of the Territory possess numerous remains of ancient Hawaiian temples (see page 179), fish ponds of unprecedented size and cleverness of construction (see pages 122 and 146), and curious artificial slides that were used in former days for a sport which was popular with all classes, called summer tobogganing (see page 178).

"It consisted in sliding down hill over carefully prepared slides, a few yards in width, on a long double-runner sled," writes W. A. Bryan in his "Natural History of Hawaii." "Any smooth mountain slope of sufficient steepness would serve the purpose.

"The only complete sled in existence is in the Bishop Museum. The two runners of this one are each just over eleven feet in length and are three inches apart. They are firmly fastened to the narrow frame. The native tobogganer would lie flat upon this curious sled, the *papa holua*, and give it a push with his foot, to start it off.

"During the descent it would frequently gain an immense velocity, and the sport, while exhilarating, must have been accompanied with great danger to life and limb. Several of the old slides are more than a half mile in length; one on the town side of Diamond Head ran far out on the plain, and another still longer one is to be seen from King street, at the opposite end of the city of Honolulu."

"The goddess of the volcano, Pele, was supposed to delight in these contests, coming disguised in some earthly form," says G. W. Browne.* "As may be imagined, she always became a dangerous rival.

"Kahavari, a Hawaiian prince, once raced with her when she was impersonating a beautiful young woman. On the first trip he outdistanced her, and when she asked for a second trial, claiming that her sled was inferior to his, he laughed at her and started alone down the descent.

"Hearing wild shouts and great confusion, he saw that she was pursuing him, riding on the crest of a lava wave. In his desperation he fled for the sea, where she could not follow him. But she threw stones after him, making the water so hot he perished. To him who doubts this tale the stones are pointed out on the beach, and the track of the lava stream is shown."

Fortunately, another exciting sport, surf-riding, was revived, before it had become a lost art, by Alexander Hume Ford, the Director of the Pan-Pacific Union of Honolulu, and is now the pastime of many hundreds of young people of all races living in the Territory.

"WHERE ARE THE VOLCANOES?"

Where are the volcanoes? is the first question that every visitor asks as soon as he lands at Honolulu, for the fact that in the Hawaiian Islands we may see the world in the making has been well and successfully advertised.

Shells of dead craters mark the Islands everywhere. Diamond Head, and the Punch Bowl, in the city itself, are perfect tufa cones formed in eruptions which occurred many millennia ago and probably lasted only a few minutes. But the most interesting volcanic creations are on the islands of Maui and Hawaii, included in the Hawaii National Park and accessible by a short voyage from Honolulu (see map, page 123).

After a horseback excursion to Iao Valley (page 170) and lunch in the tropical garden at Wailuku, Maui, on mangoes,

* "The Paradise of the Pacific," by G. Waldo Browne.

Courtesy of the Bishop Museum

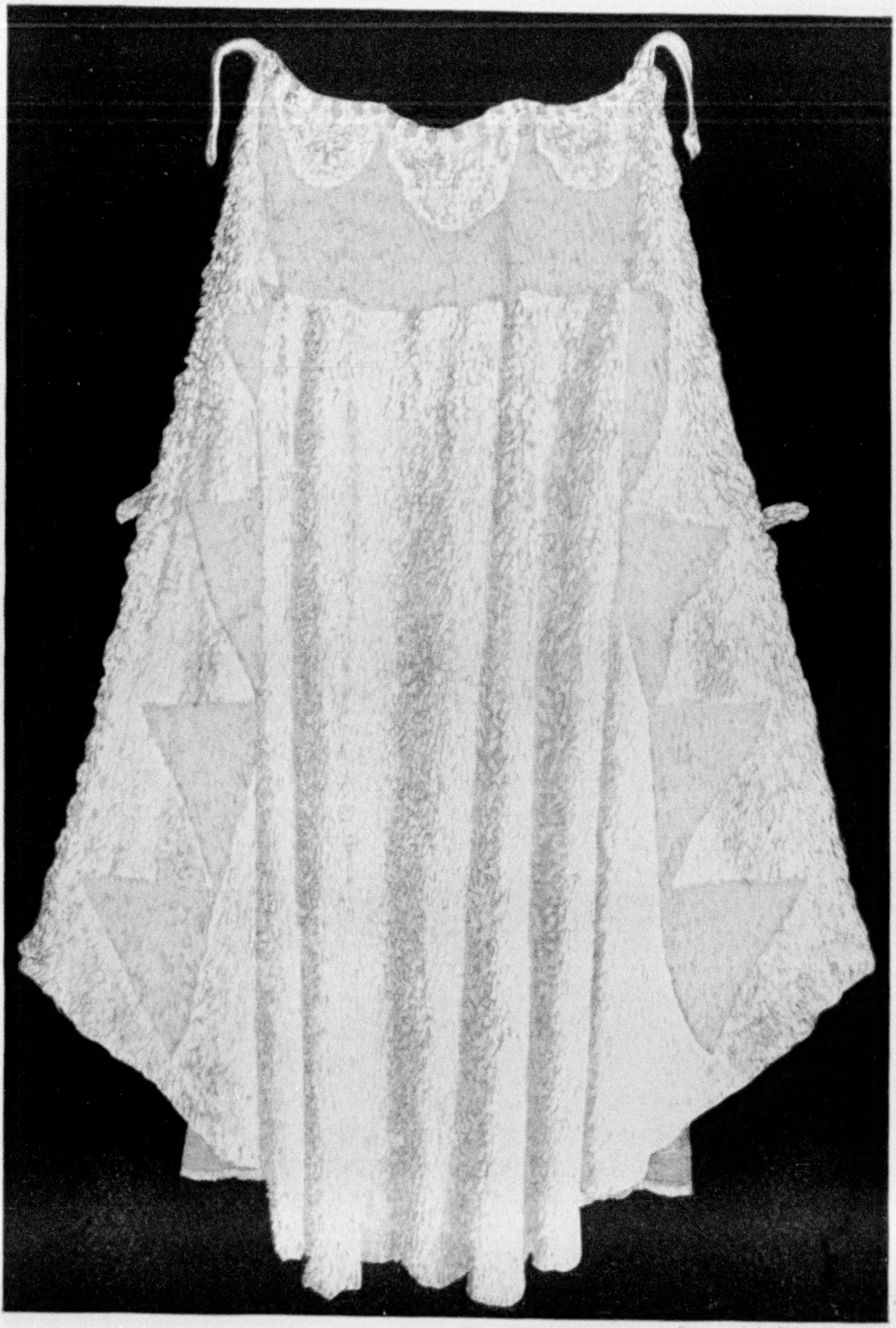
A HAWAIIAN CHIEFTAIN OF THE OLD DAYS WEARING COSTLY ROBES OF FEATHERS AND FEATHER HELMET, AND CARRYING A KAHILI, OR FLY-FLAP, ALSO MADE OF FEATHERS

(Note the anklet of sharks' teeth.)

Photograph by Joseph F. Rock

WAIMEA CANYON ON THE ISLAND OF KAUAI

It is amazing to find on a small island in the mid-Pacific this miniature of our Grand Canyon of the Colorado. It is more than one-half mile deep, and in the brilliancy of its colored walls and majesty of proportions delights the seeker for Nature's masterpieces.



Courtesy of the Bishop Museum

THE QUEEN'S MANTLE—THE FEATHER CLOAK OF KIWALAO

To make these regal robes of the ancient Hawaiians many hands working for generations were required. The "million-dollar" cloak in the Bishop Museum at Honolulu was more than 100 years in the making, and is probably the most precious garment in any museum. Only two feathers from each wing of the mamo, a rare bird, had the requisite color, texture, and length for the royal cloak.

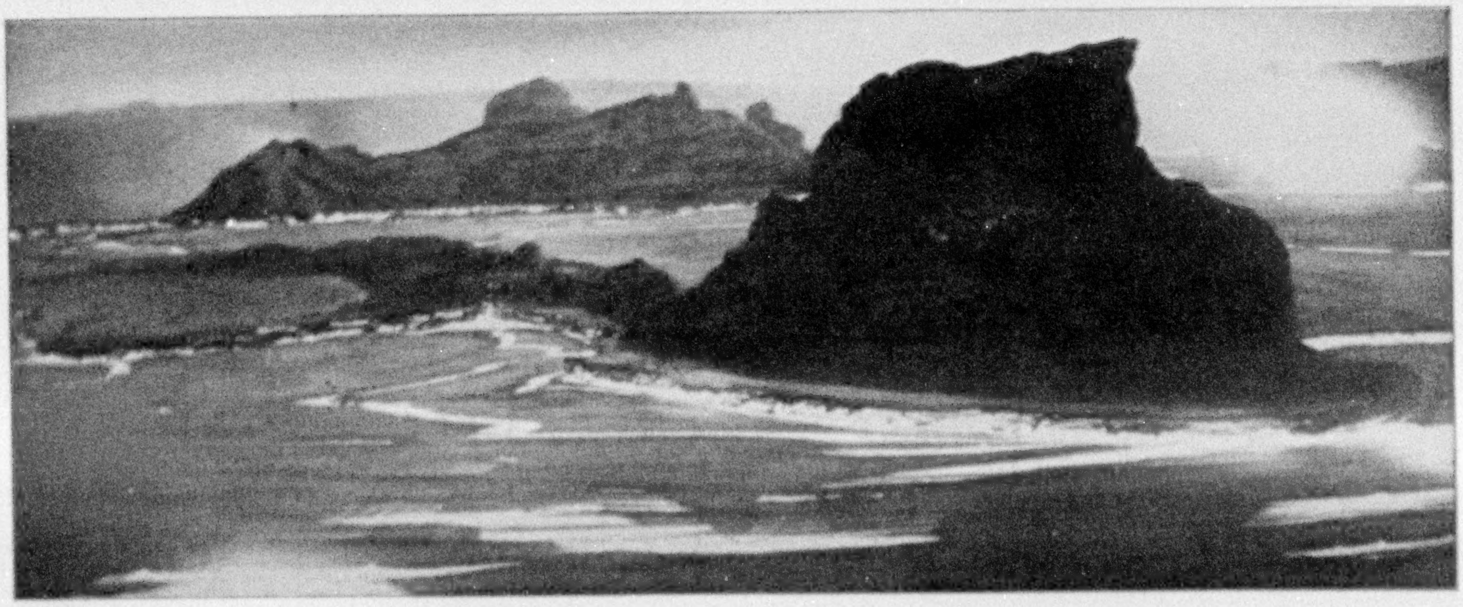
Photographs from The Volcano Research Association

GAZING INTO THE PIT OF EVERLASTING FIRE: HALEMAUMAU, KILAUEA

The fiery lake is in a state of constant ebullition. The red-hot mass of liquid rock seethes and boils like soup in a gigantic kettle.

A GIANT FOUNTAIN OF FLAME IN THE FIERY LAKE

An angry mass of molten lava has leaped 50 feet in the air and is plunging down with a terrific splashing that reverberates like thunder.



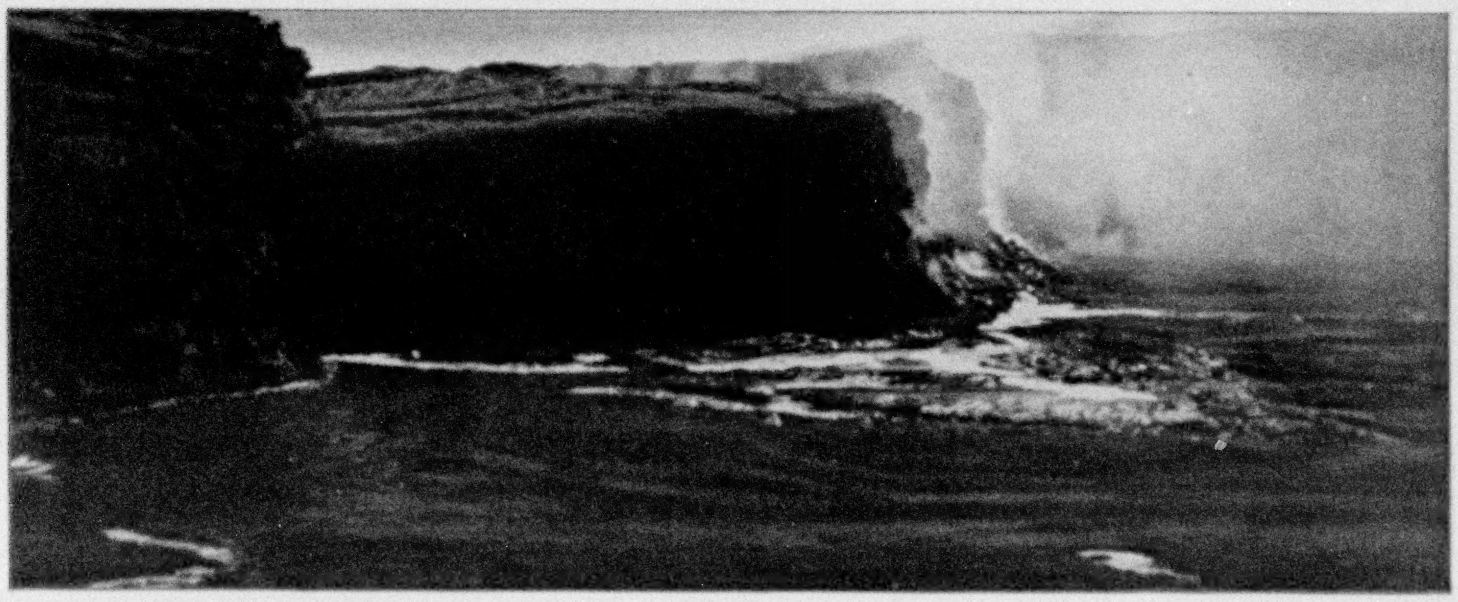
A VIEW OF THE LAKE, SHOWING SEVERAL OF THE ISLANDS, OR CRAGS

which dot its surface, and also the dark scum which covers it, like the scum on a cup of boiling milk or cocoa.

Photographs from The Volcano Research Association

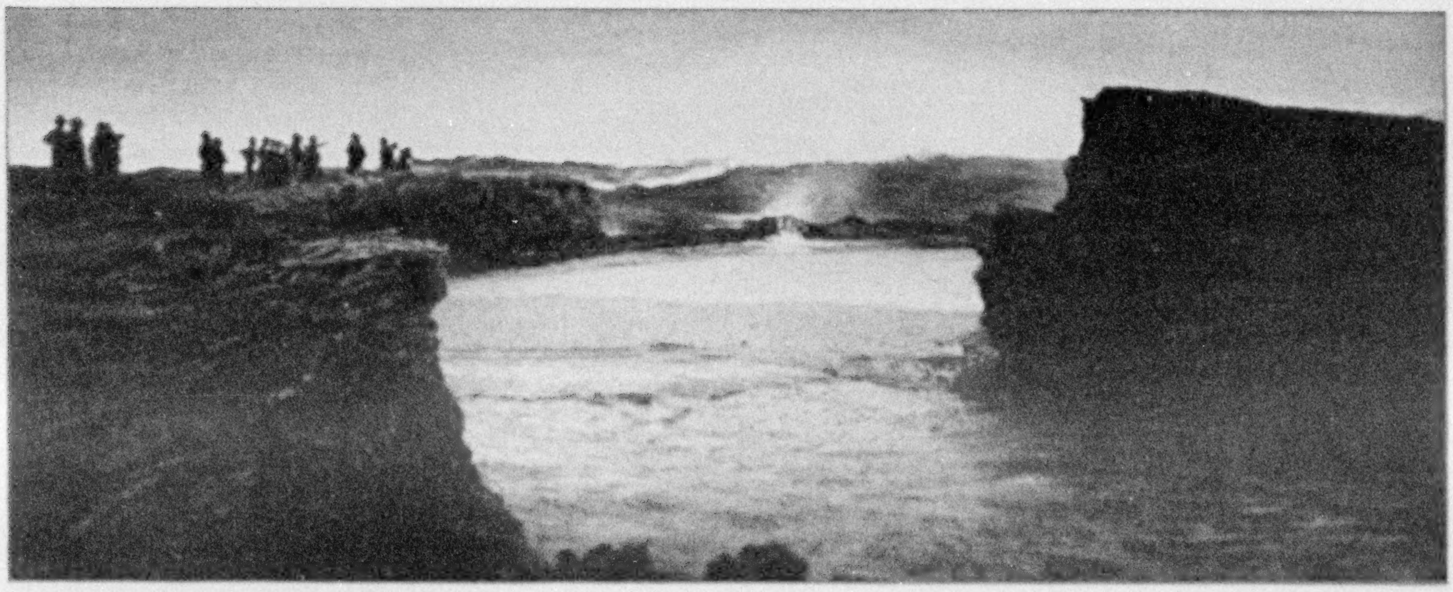
A ROW OF FOUNTAINS PLAYING IN A TUNNEL BENEATH ONE OF THE CRAGS OUT IN THE LAKE

In the background can be seen the summits of similar fountains, the picture having been taken just as darkness settled down. Note the reflection of light upon the molten lava.



RAVENOUS BILLOWS OF LAVA UNDERMINING CLIFFS OF ADAMANTINE ROCK

When the walls topple the bystander is amazed to see these great masses melt in the brimstone lake like lumps of butter on a hot frying-pan, while the escaping gases hiss fiendishly.



A RIVER OF FIRE: HAWAII NATIONAL PARK

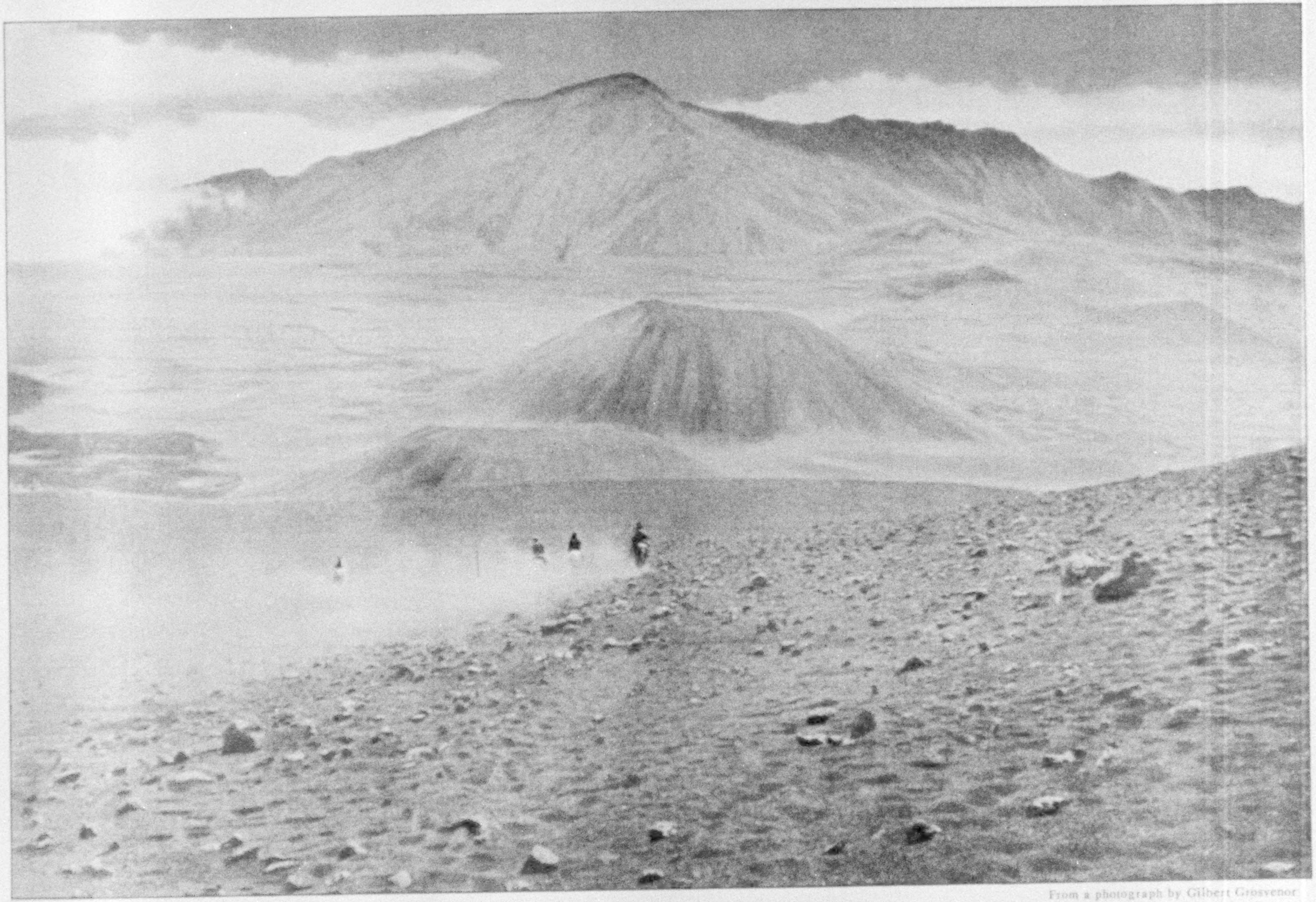
Red-hot lava which has overflowed the crater rim of Halemaumau and is rushing madly onward at a speed of 15 miles per hour.

VI

A DYING CONE WHICH HAS EMITTED A FLOW OF LAVA AS BLACK AS INK ON THE SLOPES OF MAUNA LOA

A CLOSE VIEW OF THE FIERY LAKE, HALEMAUMAU, KILAUEA

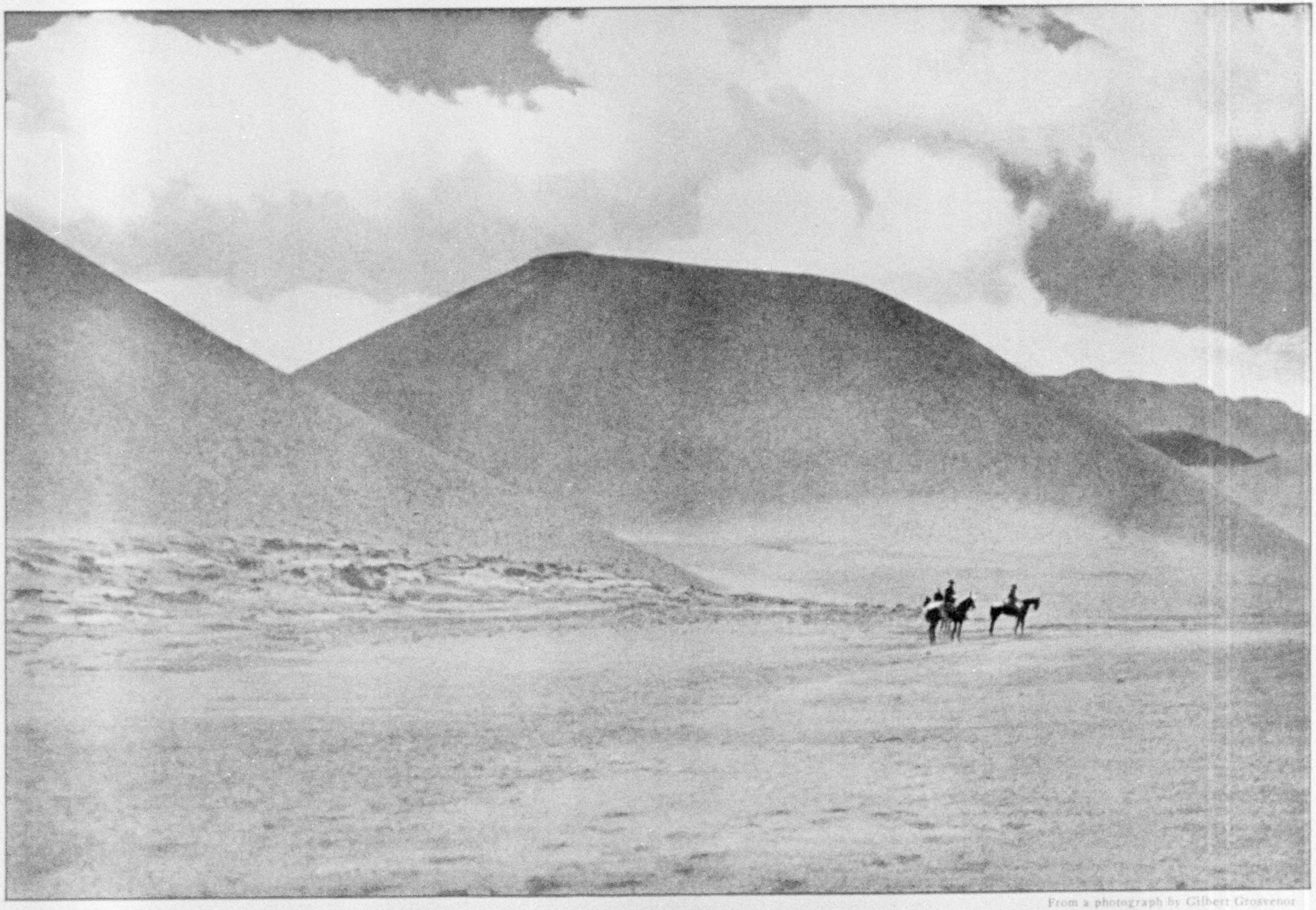
"The sight was magnificent and worth a voyage round the world to witness," wrote Admiral Charles Wilkes in the days of sailing ships.



From a photograph by Gilbert Grosvenor

ENTERING THE WORLD'S VASTEST EXTINCT CRATER, HALEAKALA, ON THE ISLAND OF MAUI

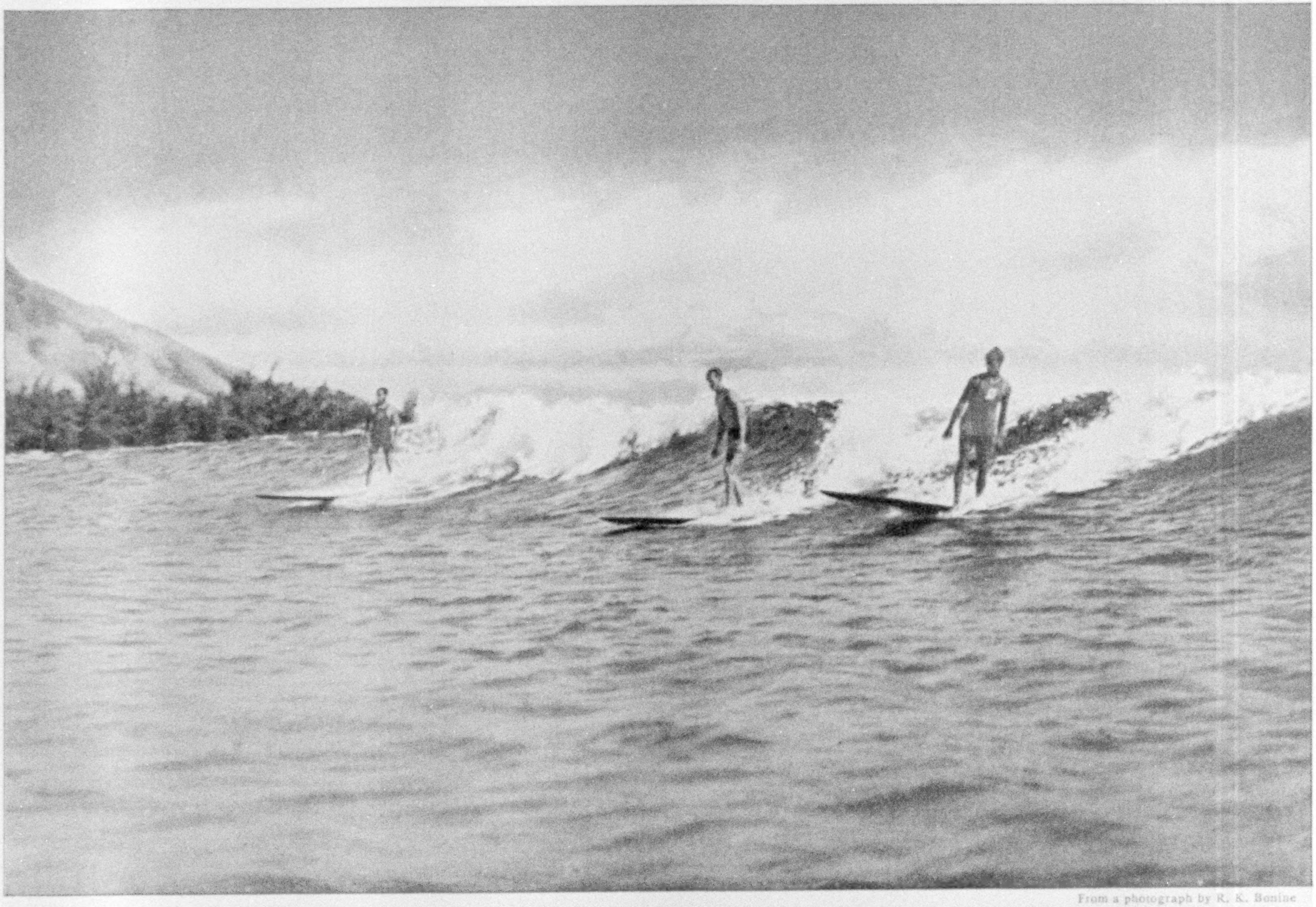
All Manhattan Island could be buried in this gigantic hole, which is 20 miles in circumference and more than one-half mile deep.



From a photograph by Gilbert Grosvenor

TWO OF THE SIXTEEN GORGEOUSLY COLORED DEAD CONES, VARYING FROM 600 TO 1000 FEET IN HEIGHT which dot the floor of Haleakala Crater and are mute evidences of its former fires. Hawaii National Park.

X

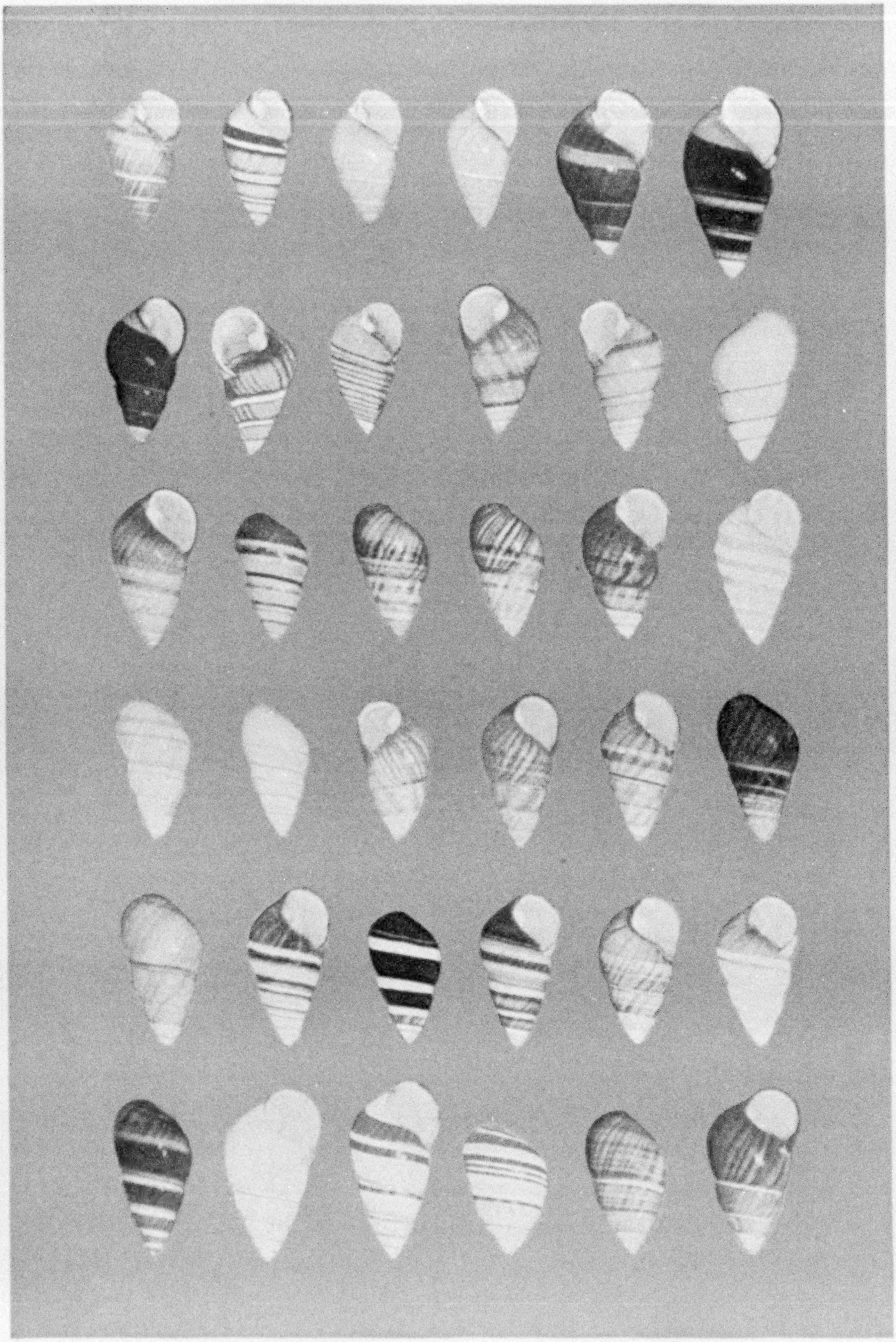


From a photograph by R. K. Bonine

RIDING THE SURF AT WAIKIKI, HONOLULU

From a photograph by R. K. Bonine

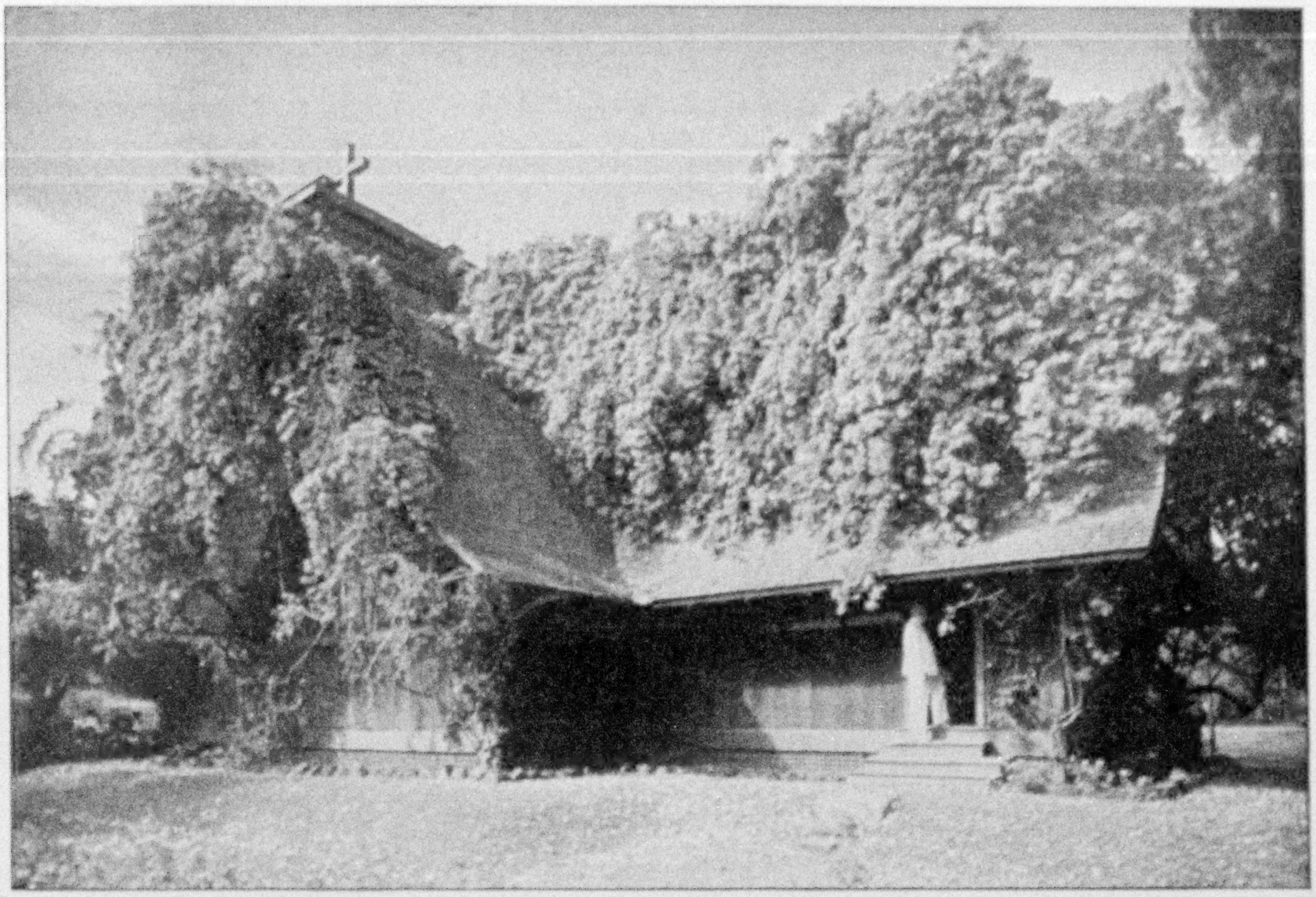
A FIELD OF PINEAPPLES ON THE ISLAND OF OAHU



From a collection by Dr. H. A. Pilsbry

TREE SHELLS (*ACHATINELLA*) OF THE HAWAIIAN ISLANDS

These snails live on the bark and leaves of trees and shrubs in the rain-forest of the mountains overlooking Honolulu. They subsist on minute fungi. In certain localities they are as plentiful as blueberries on North American barrens. Nowhere else in the world can such richly colored land shells be found, which are survivors from a very ancient geological era.



From an autochrome by Charles G. Heiser

BOUGAINVILLÆA-BOWERED ST. CLEMENS CHURCH, HONOLULU

From a photograph by Gilbert Grosvenor

THE FLAME TREE, OR *POINCIANA REGIA*, IN THE GARDEN OF WILLIAM R. CASTLE

a missionary's son born in Honolulu and one of the twelve Americans who overthrew the monarchy and proclaimed the republic.

XUM

From a photograph by R. E. Baker

HANALEI BAY, ISLAND OF KAUAI, ONE OF THE SCENES WHICH HAS WON FOR THE HAWAIIAN ISLANDS THE NAME "PARADISE OF THE PACIFIC"

From a photograph by Henry W. Henshaw

AS DIES THE DAY IN HILO, ISLAND OF HAWAII

© Arthur W. Rice

FISHING AT NIGHT IN HAWAIIAN ISLANDS

avocado, and breadfruit, swiftly by automobile we ascend from rice and sugarcane fields to acres that shipped wheat, potatoes, and corn to California in the Gold Rush of '49, proceeding from the tropics to the temperate zone in less than an hour.

THE HOUSE OF THE SUN ON MAUI

From Olinda, about 4,000 feet up on the flank of Haleakala, we took horses to the edge of the mammoth crater, which is so colossal that it is called the House of the Sun by the Hawaiians.

In four hours we had mounted from sea level to far above the clouds. Here at an elevation of nearly two miles we found a large stone house with room enough for twenty people to bunk comfortably.

Few mountain tops even in populous regions can evidence so successful an effort on the part of the community to make its natural advantages available to all. But no one familiar with Maui's history is surprised.

On this island the first newspaper in Hawaii was printed, in 1834, at the Lahainaluna Seminary. This school was one of the first in the New World to undertake manual training, and its success in teaching the practical arts inspired General Armstrong, who was born on this island, to found the Hampton Institute for American Negroes and Indians.

The panorama of cloud and mountain and valley and the glories of sunrise and sunset from the Haleakala crater rim have been described by Mark Twain and many gifted writers who have journeyed from every land to see this view (see pictures, pages 128, 146, 147, 226, and 227).

In succeeding days we descended into the vast crater abyss (see Color Plates VIII and IX), traversed its length, scrambled down the precipitous south flank to Kaupo (see map, page 145), and continued by a narrow paved trail built by some Hawaiian prince in prehistoric days to Kipahulu and Hana. Thence we proceeded by the famous Ditch Trail, past innumerable lovely waterfalls, some of them with drops of hundreds of feet, back to Haiku and Paia.

Our host and companion was a substantial banker and pineapple grower who had come to the Islands from the mainland as a young man and succeeded. His wife was a descendant of a missionary of the Second Company, which means that he was a member of the second shipload of missionaries.

The son, with thousands of others from the Territory, had served in the U. S. Army during the World War. He had been detailed to the Tank Corps and seen very rough service in France. On two successive days his companion in his tank had been shot to pieces and the tank obliterated, but he had escaped without a scratch.

A WOMAN'S TERRIBLE EXPERIENCE IN TIDAL WAVES

Hilo, the capital of the island of Hawaii, is an enchanting little city of about 10,000. It stretches along the bay of the same name, and is enveloped in waving coconuts and vegetation so luxuriant that it is almost hidden from the water. Situated on the slopes of the two active volcanoes of Kilauea and Mauna Loa, its location may be likened to a seat on a rocking chair which is rocked by the throbbing of these two Titans alternately.

There are records of as many as 70 shocks daily for one month, but the people of Hilo do not seem to mind them.

The quakes, most of them imperceptible, are not dangerous, nor are the outbursts from the volcanoes. During the more than 100 years since the missionaries landed, there has not been a single death in the Territory caused by a volcanic eruption.

The same cannot be said of the tidal waves that have raged against all the shores of the island and at times brought great destruction.

Many are the tales told.

Our hosts on a motor trip to Kalapana with their two young sons had been camping for the night on the south shore of Hawaii some months previous to our visit. In the morning the Judge was already at the wheel of the automobile which they had parked on the small wharf, and the others were standing on the pier preparing to get into the machine, when one of the boys looking toward the sea shouted, "See the great wave!" They

Photograph by Gilbert Grosvenor

THE SURFACE OF MAUNA LOA IS PIMPLED WITH MANY HUNDREDS, PROBABLY THOUSANDS, OF DEAD CONES FROM WHICH MORE OR LESS RECENTLY HAVE SPEWED GREAT QUANTITIES OF MOLTEN ROCK, AS ON PAGES 217-219

This picture was taken above the clouds, elevation 10,500 feet, near the resthouse.

Photograph by Gilbert Grosvenor

A LANDSCAPE ON THE SLOPES OF THE WORLD'S GREATEST BUILDER—MAUNA LOA VOLCANO

On the left may be seen the bed of the channel in which a torrent of lava from the cone has recently poured down. In traversing this region of sharp clinkers and powdered glass the mules sink repeatedly above the knees, thus explaining the reluctance of the ranchers to rent their animals for such expeditions.

Photograph by Gilbert Grosvenor

CROSSING A REGION OF PAHOEHOE, OR SATIN ROCK, WHICH CRUNCHES UNDER FOOT LIKE THE FROZEN CRUST OF A SNOW FIELD AND SPARKLES WITH THE RADIANCE OF JEWELS. ELEVATION ABOUT 11,000 FEET (SEE PAGES 235-236)

Along the skyline of Mauna Kea, whose bulk towers dimly in the distance, I counted 157 cones—only a fraction of the number that spotted its surface.

Photograph by Frank C. Atherton

MRS. GROSVENOR LOOKING DOWN INTO THE CRATER OF MAUNA LOA, 13,675 FEET, NOW QUIET AND NOT RECOGNIZABLE AS THE FURIOUS CALDRON WHICH WAS BELCHING FIRE AND LAVA A FEW MONTHS PREVIOUS (SEE PAGES 213 AND 236)

XUM

Photograph by C. E. Nutting

A VIEW OF EXTRAORDINARY ACTIVITY IN THE PIT OF KILAUEA

The picture was taken within 300 feet of the rim of the crater, when it seemed that the heat above and the opening fissures beneath would consume and swallow photographer, friends, and films (see also Color Plates, IV, V, and VII).

turned and beheld an enormous wall of water rushing toward them.

There was not time to flee before the tidal wave engulfed them.

The wave swept the wharf clean of a great pile of barrels and lumber, and as it receded bore the Judge's wife half a mile back into the ocean. She was an able swimmer, so felt no alarm at getting wet, but was nervous about the numerous sharks that had been lured into these waters by great quantities of dead fish which had been killed by hot lava pouring into the sea from the Alika flow (see page 160). She had nearly regained the shore when another wave carried her back, and this experience was repeated five times before she was rescued by her husband.

As the Judge is a man of very positive opinions, with the habit of expressing them, when the local paper that afternoon got out an extra, with great headlines reaching across the page, "Carlsmiths swept out to ocean by tidal wave," it is said some malefactors sighed with relief, until they read in small letters further down "and brought back again."

The tidal wave which overwhelmed our friends was probably caused by a sudden flow of lava through a subterranean passage into the sea.

The island of Hawaii is actually at the present time being built up from the ocean. Considerable portions of it are still so new that the glass ejected by the volcanoes to form the new land has not yet had time to disintegrate, and often the automobile road is composed of powdered glass compressed until it is compact. When the sun's rays strike it aslant, the road gleams.

Though called a mountain, Kilauea Volcano has not the slightest resemblance to a mountain, being a great cup-like depression in an extensive plain. In the center of this depression there is a deep throat in which red-hot lava rises and falls like the mercury in a thermometer. No words can describe the fury of this raging, billowy red lake, but the pictures (Color Plates IV, V, VII, and pages 184,

229, 230, 231, and 232) will convey some conception of its impressiveness.

OBSERVATORY PERCHED ON VOLCANO'S RIM

Perched on the edge of the volcano is the laboratory and home of Dr. Thomas A. Jaggar, who for 15 years has been the Director of the Hawaiian Volcano Observatory, maintained by public-spirited citizens of Honolulu. This observatory is the famous center of the important new science of vulcanology, the study of volcanoes and earthquakes, in which Dr. Jaggar is one of the pioneers.

Forewarned of prospective eruptions by the earthquake tremors which his instruments record, Dr. Jaggar is ready, as soon as a new building operation is initiated by a volcano, to proceed to the locality and record in photograph and notebook every stage of construction.

Thus he secured a complete photographic history of the Alika river erupting from the flank of Mauna Loa in 1919, one of the tremendous lava flows of the century (see pages 160, 216-224).

He tells of his visit to the scene of greatest volcanic activity in a dramatic report:*

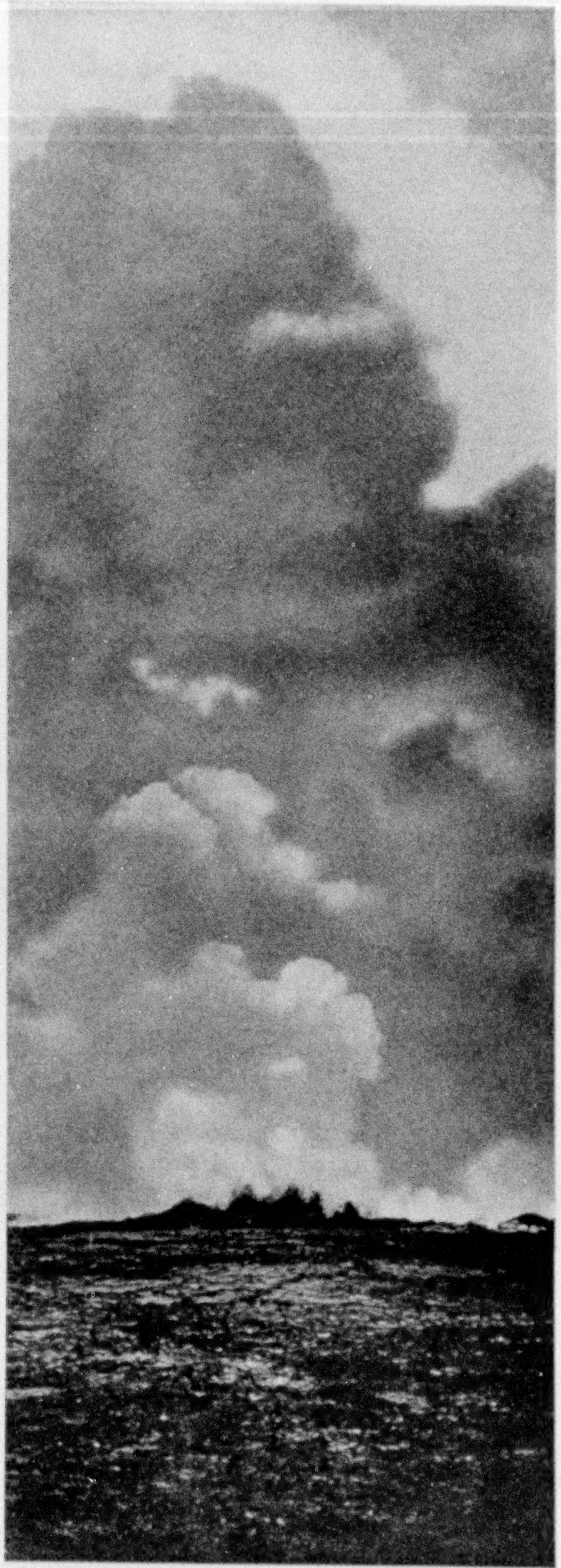
"The horses were left at a high flow of brown block lava, and the walk to the source fountains was across some ten alternations of AA and pahoehoe" (see picture, page 235). "Here could be seen the line of rift cones, some forty cones visible at one time, a true fissure eruption, along a crack" (see page 216).

"Great fountains were spouting continuously along the fissure for a thousand feet, like a wall of red flames, and in detail they were seen to be made of incandescent, light crumbly material, yellow when it shot up and red when it came down.

"The noise was a roar like surf on the rocks, and was occasioned by gas rushing through a lava pool filling the rift, churning it to a foam, and flinging up the foamy matter to solidify as it fell. . . .

"We proceeded across much-faulted ground to the immediate base of the rampart built by the fountains and hemming in the eastern margin of the great lava lake. . . .

* From Monthly Bulletin of the Hawaiian Volcano Observatory, Vol. VII, No. 10.



Photograph by Hawaiian Volcano Observatory

MAUNA LOA SIGNALING THAT IT IS ABOUT TO RESUME BUILDING OPERATIONS

Activity of this violence in the crater is usually a portent that a rift soon will open on the flanks of the mountain and a river of lava begin to flow. The column of lava fume and flame is 10,000 feet high.

THE FIRST STAGE—A SUDDEN RIFT, PROBABLY CAUSED BY THE SURGINGS OF THE LAVA IMPRISONED BENEATH THE CRUST, AND ATTENDED BY EARTHQUAKES

Shortly after the photograph was taken, lava poured forth in the manner shown in the picture below.

Photographs by Hawaiian Volcano Observatory

THE SECOND STAGE—"ARTESIAN" WELL OF RED, MOLTEN LAVA SPOUTING UP FROM THE GROUND

Photograph by Magoon

A SPOUTING CONE AT THE SOURCE OF THE ALIKA FLOW, MAUNA LOA, VOMITING MOLTEN ROCK, BLOOD-RED BUT FLUID AS WATER

"The ridge where we stood was 50 feet above the old ground level, and 50 yards north of us stood the highest peak of the rampart wall, a singular structure when seen end on. It stood up as a narrow slab or shell confining the mighty fountains, and its height above the outside ground was about 100 feet" (see page 217).

"Next to it the fountain jets sprayed up continuously half again as high, the glowing soft fragments eternally pounding down upon the rampart, plastering it with the new matter or rolling noisily down the outer slope, gilded with a mottled fiery pattern. . . .

WHERE THE LAVA FLOW PLUNGED INTO THE SEA

"Through the southwestern wall the lake had found an outlet, and here, in a gorge 40 feet wide, rushed the main lava flow, like the sluiceway of a dam. This flow, only 100 feet west of us, made a fiery river, with current estimated eighteen miles per hour. . . . The stream appeared shallow, with many standing waves and bright grottoes along its banks.

A FOUNTAINING CONE AT THE SOURCE OF THE ALIKA FLOW, MAUNA LOA: DAY SCENE

In the foreground is an old Hawaiian altar, where human sacrifices were made to the volcano goddess in ancient times.

Photographs by Hawaiian Volcano Observatory

EARLIER STAGES IN THE ALIKA FLOW: ALONG A CRACK EXTENDING SEVERAL MILES WHICH HAD SUDDENLY APPEARED ON THE SLOPES OF MAUNA LOA, JETS OF LAVA AND VAPORS ARE POURING (SEE TEXT, PAGE 213)

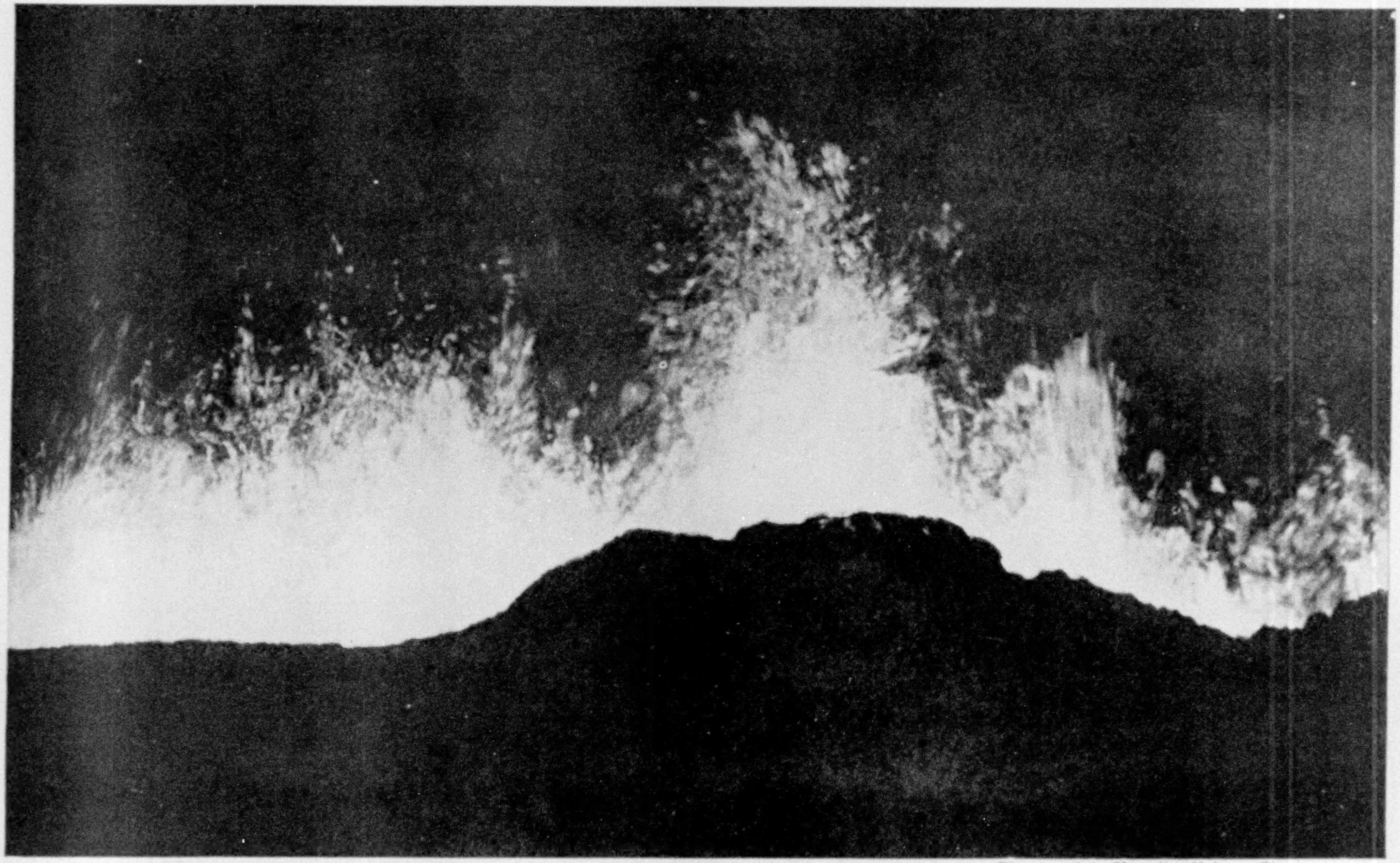
Photograph by Hawaiian Volcano Observatory

THE BATTERY OF 200-FOOT LAVA FOUNTAINS FORMING A BARRAGE HALF A MILE LONG; BY DAY: ALIKA CONES, MAUNA LOA (SEE ALSO PAGE 219)

Photograph by Hawaiian Volcano Observatory

ACTIVE CONES AT THE SOURCE OF ALIKA FLOW, MAUNA LOA, 7,000 FEET ABOVE SEA-LEVEL (NIGHT SCENE)

The flow is pouring out of the cone in the foreground.



Photograph by Hawaiian Volcano Observatory

A BATTERY OF 200-FOOT FOUNTAINS BY NIGHT: ALIKA CONES, MAUNA LOA (SEE ALSO PAGE 217)

What causes these terrific manifestations of Pluto's power? Science cannot answer.

"The writer obtained one glimpse of the lake surface by climbing the rampart at the northeast end, where the summit was only 40 feet high and the fountaining less violent than at the south. The heat was intolerable, but by choosing a moment when the falling of fragments was at a minimum, it was possible to scramble to the edge, look in, and then beat a quick retreat. A definite lake surface of heaving, foamy lava lay about 20 feet below the edge. . . . It was at this lake that the Alika flow took its rise. . . .

"The stream plunged into the sea at the Alika shore over an older flow of the same sort fourteen miles from the source rift.

"The stream continued to flow as a lava river for ten days.

LIGHTNINGS FLASHED IN STEAM COLUMNS

"The uprush of steam where the lava made contact with the sea" (see page 160) "carried up rock fragments and sand and built a black sand cone" (see page 223). . . . "Lightnings were seen in the steam column. There was much muddying of the water and fish were killed in considerable number. . . .

"Great raft blocks of lava, red hot or black or red below and black above, rode along with the current, either smoothly or rolling over, as though striking on the bottom (see page 235).

"The color effects at sundown at the rift source on Mauna Loa were gorgeous beyond description. Over the scarlet fountains rose the sheets of red and green flame topped with lilac fume, against a murky green or blue-gray background. Above rose the great buff-colored volutes of cloud, with individual billows coffee-colored or brown. All of this was backed by an outer sky of deepest cobalt blue, with normal distant horizon clouds of pearly gray."

A week later, on his second expedition to the source rift of the Alika flow, Dr. Jaggar was accompanied by Mrs. Jaggar, Dr. and Mrs. J. R. Judd, and guides.

"The fountaining and overflow at the middle group of cones by this time had vastly increased, and the noise had changed from a mild roar, like the surf on a rocky coast, to a loud, thunderous pounding. . . .

"The middle fountains increased in violence and height until the whole series of vents there became one gigantic line of geysers, with maximum jets estimated 500 feet high, at about 4 a. m., October 10.

"About 9 p. m., in order to collect gas, I took vacuum tubes of 300 cubic centimeters' capacity, and on attempting to reach the live flames of the northern cones found it necessary to cross to leeward of fresh flows making gas and heat which were both insupportable.

"The gas was quite different from the smoke of the south rampart, which had been suffocating in volume, but still somewhat tolerable with the aid of a wet cloth over the nostrils. The northern gases were not visible; they had no odor except the foundry smell, but they corroded the eye tissues and gripped the lungs so as instantaneously to stop all breathing. A wet cloth produced no improvement whatever, and there was no possibility of crossing this gas belt and surviving, unless with an oxygen helmet."

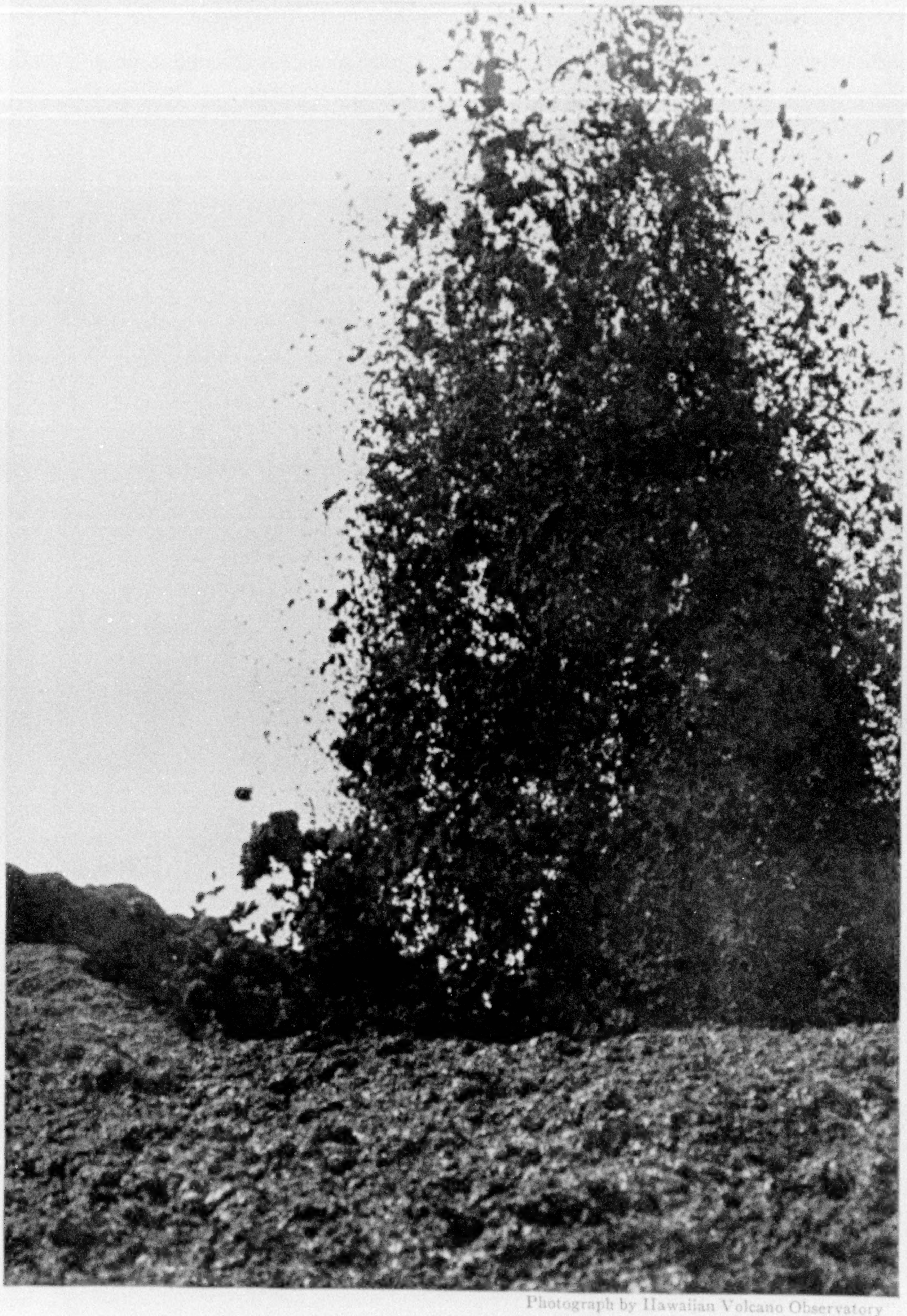
As the great anxiety of the South Kona ranchers continued unrelieved by any complete information as to what was transpiring on the mountain above them, Dr. Jaggar and Dr. Judd organized a third expedition.

"On the morning of October 25 an excursion was made around to the east side of the rift line in order to compare conditions with what had been observed in the earlier stages of the eruption. The rift line is a distinct single crack trending south-southwest and the big cone craters are developments due to lava and gas rising through this crack.

"This development began with the southern, or Alika, cone, and in the course of a month has deserted that end and built up the northern cone a half mile away.

"The line of cones was now a high ridge, rising in places 200 feet above the surrounding country, banked up by flows and pumice for nearly half this height, the three main eminences of the ridge being big horseshoe cones north, south, and in the middle, the southern one dead, the other two alive, and the northern one roaring, fountaining, and flowing continuously. . . .

"Over the high summit lip the fountains would fling their red, crumbly fragments, which poured down in an endless



Photograph by Hawaiian Volcano Observatory

PROFESSOR JAGGAR'S MASTERPIECE: A LAVA FOUNTAIN 200 FEET HIGH, PHOTOGRAPHED AT A DISTANCE OF ONLY A FEW FEET; MAUNA LOA

(SEE PAGE 224)

XUM

Photograph by Morihiro

ALIKA LAVA FLOW POURING IN A CHANNEL DOWN A HILLSIDE, AMID FIELDS OF ITS OWN SUBSTANCE. THIS SLOPE OF MAUNA LOA WAS FORMERLY COVERED BY A DENSE FOREST (SEE PAGE 160)

Photograph by Hawaiian Volcano Observatory

THE ALIKA FLOW, MAUNA LOA, WHERE IT ENTERED THE OCEAN (SEE PAGE 160)

The last flow was very sluggish and went directly through the sand piles which had been thrown up by the lava exploding as it reached the ocean in the earlier stages of the flow.

avalanche of fire on the steep outer slope. The wind on this hot surface set up small tornadoes lasting several minutes, moving along the slope and picking up the light pumice in violent, noisy whirls.

"Taking advantage of the long low spur on the north side, I climbed that slope in order to get an instantaneous photograph of the fountain by as close an approach as possible. It was necessary to clamber up through pumice knee-deep and excessively hot.

"On the other side of the spur, which was the east end of the inclosing horseshoe ridge, lay the fountaining basin, with its gigantic waves surging forward to the cascade outlet, and from under the back wall of this cup rose the geyser of fiery fragments 200 feet above the level of the top of the spur, the pieces bright red hot and very porous, from six inches to four feet in diameter.

"It was evident from occasional fragments on the ground still glowing, and from the incessant change of direction of the jets, that the nozzle might at any moment be turned in my direction, so that it required quick work to get to the summit of the spur, point and snap the camera, and get away without being bombarded" (see page 221).

"The sensation of incessantly looking up at that towering curve of rising and falling bombs and calculating its angle, with the heat almost insupportable and the noise deafening, was an experience not soon to be forgotten.

"I succeeded, however, in getting to the edge of the inner declivity and taking a look down into the basin, as I pointed the lens and discharged the shutter. It all had to be done in much less time than it takes to tell it, for a very few seconds of the heat would have ruined the camera. The far wall of the basin made a reflector for the heat; so that, but for the wind at my back, it is doubtful whether I could have reached the edge at all.

"The interior of the basin was like a titanic open chalice of fiery liquor foaming in scarlet surges, these being impelled continuously forward by the geyser jets behind, the flood lifted by the jets losing its liquid aspect almost instantly, the expanding gas within the jet giving it the appearance of very loosely knitted worsted.

"The frothing surges were quite as liquid in appearance as any beaten foam and the mass bubbled and seethed, quickly quieting down to form black skins where the pond cascaded through the sluiceway leading to the flow channel. The nearest falling fragments at the moment of taking the picture were apparently 50 feet away."

THE ASCENT OF MAUNA LOA

We tarried several days around Kilauea, fascinated by the many varied manifestations of Pluto's power (see Color Plates IV, V, VII) and enjoying the refreshing fern forests (see page 164); but ever on the horizon, dominating every view, towered the huge, challenging bulk of Mauna Loa. Having read the descriptions of its ascent by Admiral Wilkes, Titus Coan, and Professor Jaggar, which are among the epics of geographic literature, we were determined to make the personal acquaintance of the greatest architect, contractor, and builder on our planet.

As a half-way house had been constructed at 10,500 feet and an admirable trail broken to the summit by a company of American soldiers by direction of Major-General W. H. Carter, when he was commander of the Department of Hawaii, all that was required for the ascent to the crater was the ability to endure three days in the saddle, immunity from mountain sickness, and, most important, sufficient eloquence to persuade a rancher to hire out his mules. In this last particular we received assistance from Professor Jaggar; seven mules and two guides were secured and we were off.

Our trail was fairly even and the grade of ascent so gradual as to be almost imperceptible. No chasms or ravines interrupted our progress, as on the older islands, their absence attesting the youth of this part of the mountain.

A FRIGHTFUL DESERT ABOVE 8,000 FEET

Several miles out we passed through a forest of giant koa (see page 144), some of which have straight trunks running up 50 feet without a limb.

The vegetation soon became sparse, and then the last vestige of green disappeared. Mauna Loa above 8,000 feet proved to be a frightful desert, at once "the creation and the prey of the mightiest force on earth."

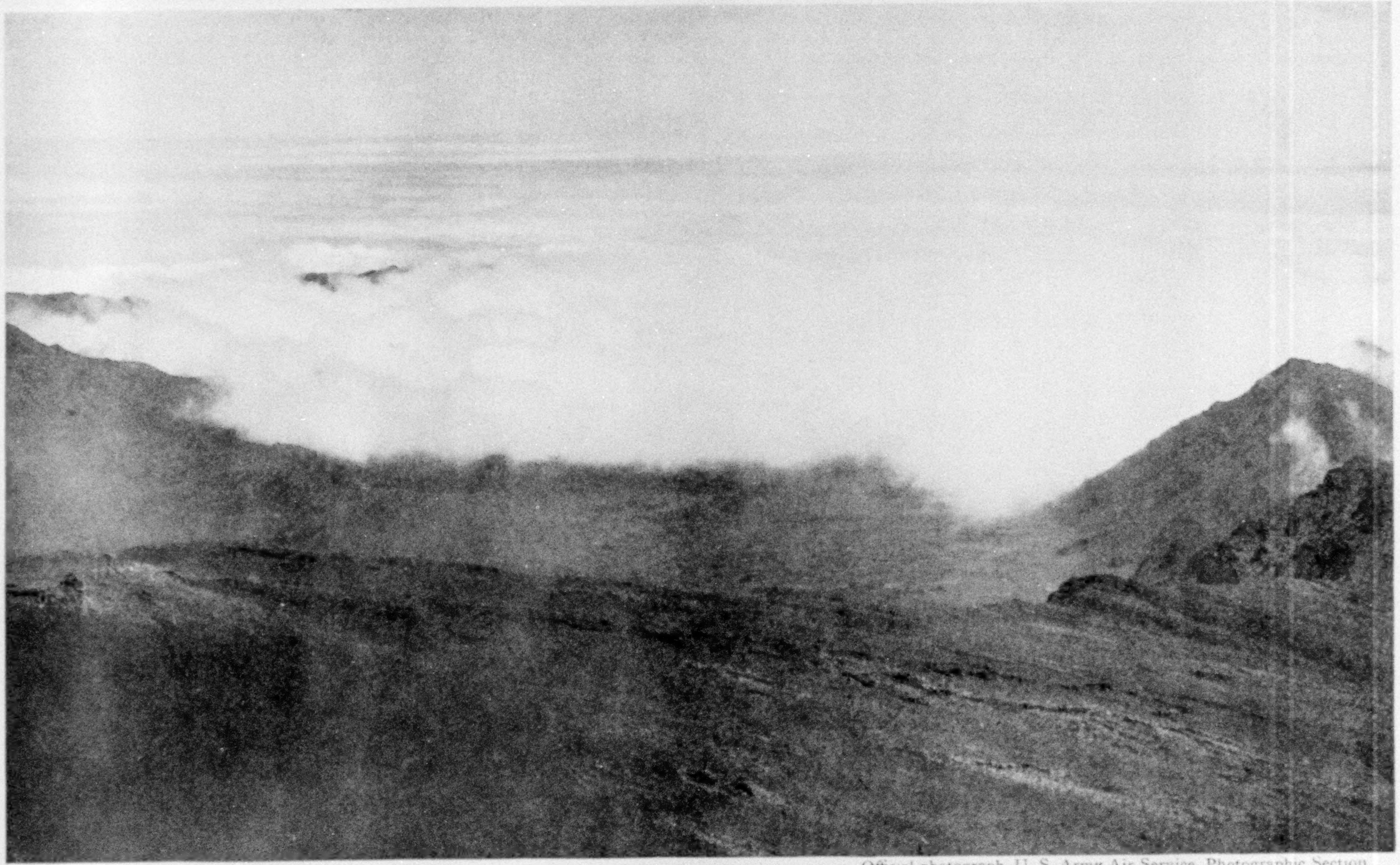
This desert is composed of a great sea

Official photograph, U. S. Army Air Service, Photographic Section

THE NEW AVIATION FIELD AT KAHULUI, ON THE ISLAND OF MAUI

Forced landings in the channels between the Hawaiian Islands are not a joyous thing to contemplate; for, as the sea is very rough, a plane would last but a short time in the high waves, and incidents such as tiger sharks are not pleasing to contemplate. On the expedition which resulted in these photographs the squadron of four planes guarded against mishap by flying across the channels only in formation, one ship carrying radio, so that in case of motor failure this plane could remain near the fallen plane while a third plane could return for help.

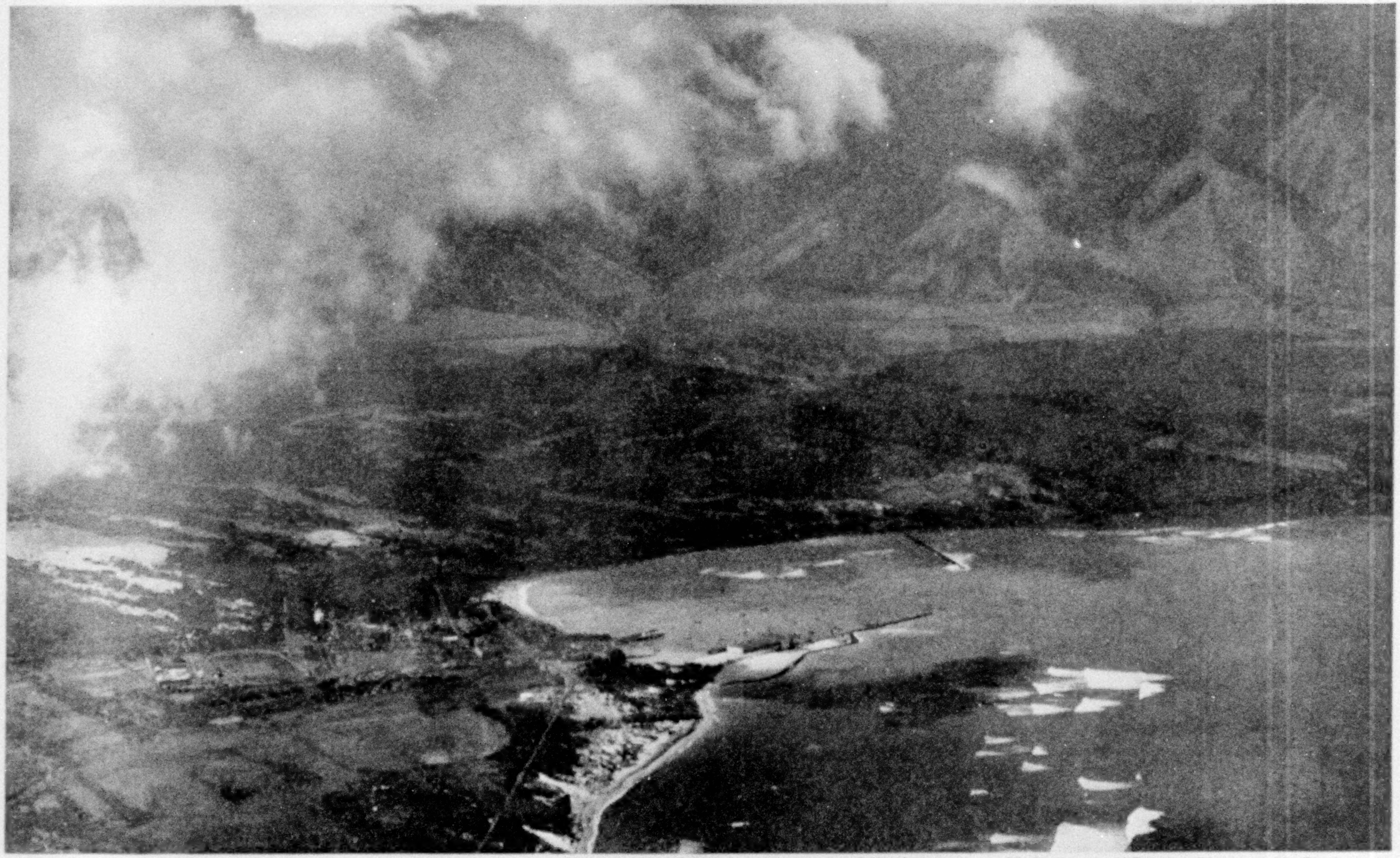
This and the succeeding seven illustrations (pages 226 to 232, inclusive) were made from photographs taken by Lieutenant R. C. Wriston, commanding the 11th Photographic Section, and his assistant, Sergeant Richard L. Agnew. The photographs were made for scientific purposes, at the suggestion of the National Geographic Society, and were taken, in the course of mapping, by aerial photography, all harbors in the Hawaiian Islands, which survey had been ordered by Major General Summerall, Commander of the Department of Hawaii.



Official photograph, U. S. Army Air Service, Photographic Section

A SEA OF CLOUDS CREEPING IN TO THE EAST, WHERE THE WHOLE SIDE OF HALEAKALA VOLCANO, ON THE ISLAND OF MAUI, HAD BEEN BLOWN AWAY. PHOTOGRAPH TAKEN FROM AN ELEVATION OF 11,000 FEET (SEE PAGES 128, 147, 207)

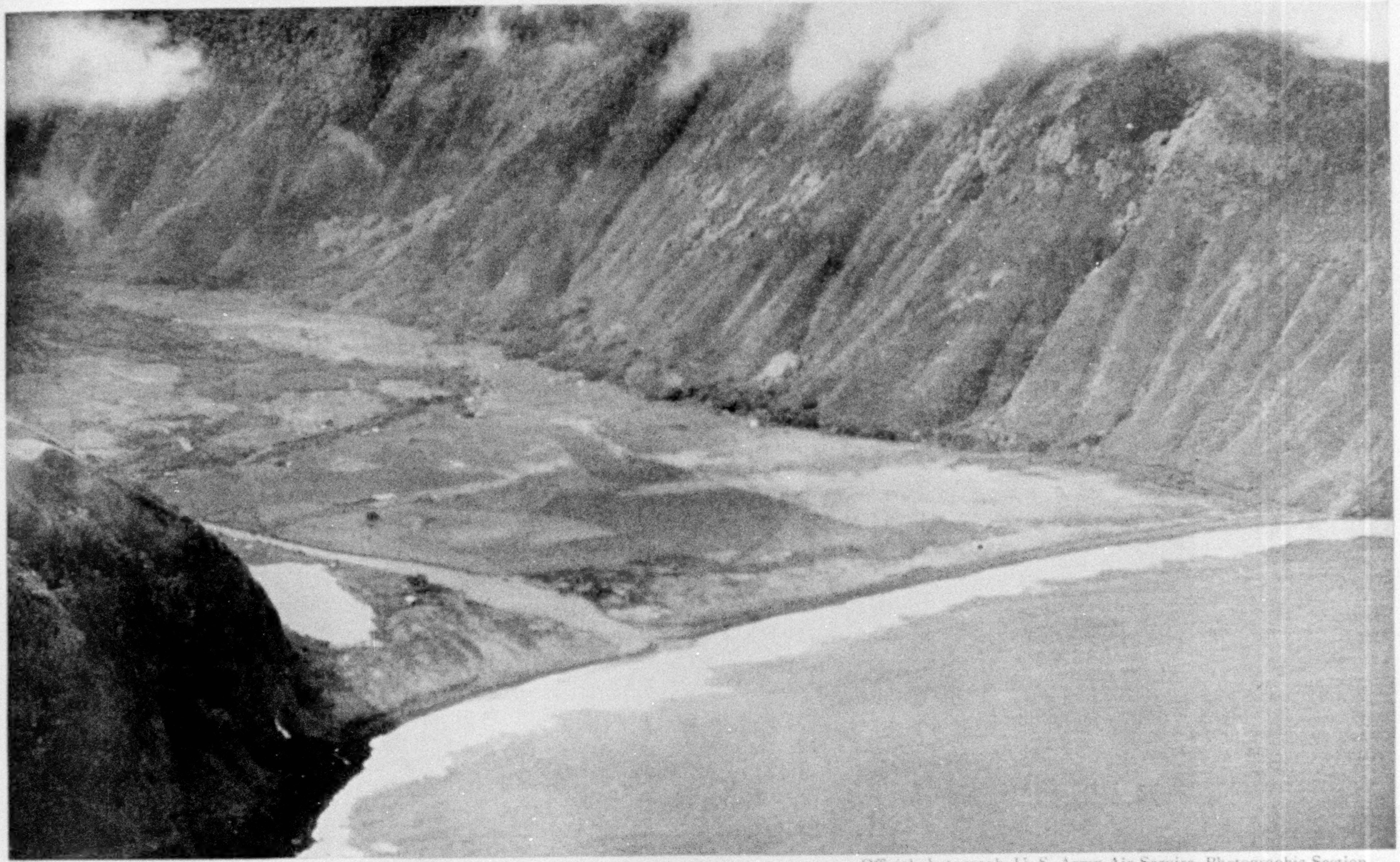
"We climbed steadily, dodging clouds, until we finally left them below us. Ahead stretched an unbroken sea of clouds, with Haleakala, a magnificent island, rising through them. Breasting the southern shoulder, we got our first glimpse of the immense crater, theater of vast volcanic action in the long-forgotten ages. Within the crater could be seen many smaller cones or craters, all good-sized hills, and between them the lava flows, distinguishable by their variation in color as the work of different ages."—LIEUTENANT R. C. WRISTON.



Official photograph, U. S. Army Air Service, Photographic Section

THE IAO VALLEY AND KAHULUI, ISLAND OF MAUI, FROM AN ELEVATION OF 7,000 FEET

The journey from Oahu to Hawaii was broken on the trip out at Kahului, but the return journey of 235 miles was made, without stop, in two hours and twenty-five minutes (see map, page 123).



Official photograph, U. S. Army Air Service, Photographic Section

WAIPIO VALLEY, A SMOOTH, NARROW VALLEY ON THE NORTHEAST COAST OF THE ISLAND OF HAWAII

In his account of the flight from Luke Field, on the island of Oahu, to the island of Hawaii, Lieutenant Wriston relates a thrilling experience, when the squadron of planes was forced down by storm clouds until the airmen were barely skimming a cliff. When the cliff came too close for comfort, the aviators took to the sea, flying at about 1,000 feet elevation. Despite the danger, which seemed imminent, of being lost in the rain and clouds, the airmen were compelled to admire the beauty of the scenery—numerous waterfalls breaking upon the cliffs, with here and there smooth, narrow valleys, small farms, and villages. A forced landing here would have been desperate, indeed.

Official photograph, U. S. Army Air Service, Photographic Section

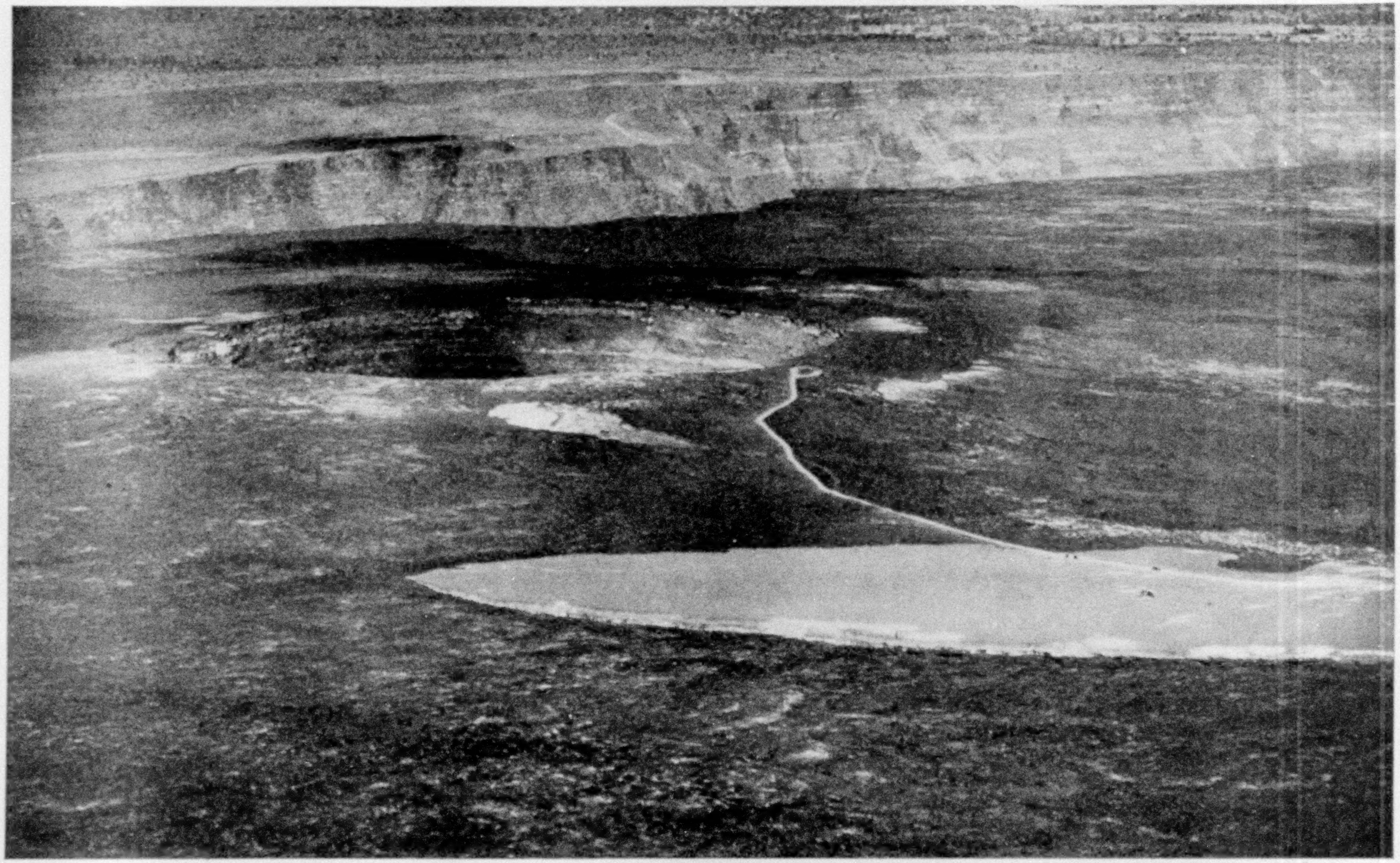
KILAUEA MILITARY CAMP AND THE CRATER: PHOTOGRAPH TAKEN FROM AN ELEVATION OF 500 FEET

The island of Hawaii is peculiar in that it has, in its vast extent of 4,000 square miles, scarcely a place which is naturally suitable for a landing field, without the expenditure of considerable labor and money. Being the last of the islands to be formed by Nature, it still is in a "raw state." Its immense mountains and its vast plains have in their formation considered not the airplane and its needs. Rough lava flows, boulders, earthquake cracks, and dense tropical vegetation alike offer poor facilities for a landing. A landing field was finally prepared on a stretch of old lava within the crater of the volcano itself (see page 228).

Official photograph, U. S. Army Air Service, Photographic Section

EARTHQUAKE CRACKS AND STEAM VENTS WEST OF KILAUEA CRATER

After gaining the necessary altitude, the airmen swooped down across the pit of Kilauea, barely 10 feet above the rim, at an indicated speed of 120 miles an hour. On the return trip the plane crossed, at 80 miles an hour, so close that a slight "zoom" was necessary to clear the farther wall. It proved rough flying, not in the way that ordinary rough flying is bumpy: there were hard, sudden bumps, causing a continual flutter, which kept the plane rocking while passing over the pit.



Official photograph, U. S. Army Air Service, Photographic Section

APPROACHING THE PIT OF KILAUEA AT AN ALTITUDE OF 1,000 FEET (SEE ALSO ILLUSTRATION, PAGE 184)

The pit was photographed from various angles and from points closer and closer to the edge, until a view was taken on a sharp angle looking directly into the writhing, boiling, red-hot lava (see page 232). The camera airman here began to experience "rough weather," and could smell the fumes of sulphur despite his rapid passage. As he flew to the windward of the pit, his goggles were suddenly clouded with what appeared to be a fine dust. An old lava flow is utilized as a landing field, on which an airplane may be seen near the white automobile road.

XUM

Official photograph, U. S. Army Air Service, Photographic Section

THE FIRST AËRIAL PHOTOGRAPH EVER MADE OF THE FAMOUS "FIRE PIT" IN THE CRATER OF KILAUEA: ON THE ISLAND OF HAWAII
(SEE PAGE 184 AND COLOR PLATES IV AND V)

of lava; of terrible clinkers and taffy-like satin rock dotted with thousands of cones, some very large, others mere baby craters, which remain as monuments of the powerful fires raging inside this immense dome.

At the end of nine hours' easy traveling, we reached the comfortable rest-house at Puu Ulaula, where we were to pass the night (see page 182).

So gentle had been our ascent that not till we dismounted and paused to look behind and around did we realize the distance we had traversed or the height to which we had ascended.

Many miles away and far below, a great slanting column of white smoke shone silver in the sun; this was the fume cloud that is ever rising from the "Pit of Everlasting Fire," Kilauea (see page 188).

A few hundred yards to the north a group of exquisitely formed cinder cones (see page 208) marked the scene of some former volcanic tempest, which might have occurred a year, a century, a millennium before our visit. The alternations of heat and cold, of rain and snow, seem to leave no effect upon the mountain's surface at this elevation. At least, to our eyes there were no evidences of decomposition by the weathering of time.

From the heights of these cones we could trace the course of the great black river of the 1880-1881 eruption, which had burst from the flanks of the mountain near by and for a while threatened to bury Hilo (see map, page 183). As we followed its track, we could easily picture the state of mind of the people of that lovely town as the river of molten rock headed for their homes. It pushed so near that they could feel its fiery breath in the city streets, and its foul sulphurous stench blotted out the fragrance of Hilo's exquisite gardens.

PRINCESS' HAIR PROPITIATED THE FIRE DRAGON

What stopped that obliterating mass a scant half mile from the city gates?

The native Hawaiians say that after every recourse of the missionaries had failed, the Princess Kamehamena, the last of the royal family, was begged, in accordance with the ancient custom, to cast a lock of her raven hair into the stream. The Princess consented and sacrificed one of her loveliest tresses; the stream was appeased, "the great red dragon lay stiffened and harmless" a few yards from the town, and the record held by Samson's locks since biblical days passed to Hawaiian tresses.

This river of melted rock had been moving for six months, varying in speed from 15 miles an hour in the earlier stages to a few feet per day. It had advanced 35 miles and covered an area greater than the State of Rhode Island some feet deep; and yet, in proportion to the bulk of this huge dome, was no larger than one slap of paint from a brush is compared to the whole house.

No words can picture the soft, fleecy, rounded blanket of cloud masses, white as purest snow, which gathered as the sun dropped behind the horizon, and nestled close around the mountain below us (see pages 184 and 208).

Presently the snowy mantle also enfolded our neighbor, Mauna Kea, until only her summit was visible. Peering above the blanket of cloud, 100 miles away, appeared the huge bulk of Haleakala volcano, on the island of Maui, which we had ascended a few days before (see pages 128, 207, and 226).

A NIGHT OF COMFORT IN THE REST-HOUSE

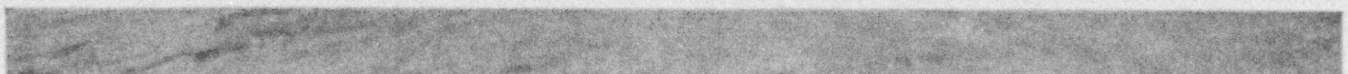
We had been keeping a rather strenuous program for some weeks, and as we enjoyed the comfort of that rest-house, with its roomy bunks, wood stove, and tight walls, which shut out the cold and penetrating wind, notwithstanding our agreement to get up at daylight I should not have been much disappointed if our experience next day had been like Mark Twain's on a similar occasion. He has described how he and his companions reluctantly struggled out of their bunks and, wrapping themselves in their blankets, sat down outside and waited for the sun to rise; but instead of getting lighter, the sky became darker and darker. The sun was going down, not up!

Resuming our journey to the crater the next morning, we passed strings of "coke ovens," originally gas vents whose domes had collapsed.

Occasionally, softly flowing jets of evil-smelling steam by the trail reminded us that fires are still glowing inside.

Photograph by C. S. Carlsmith

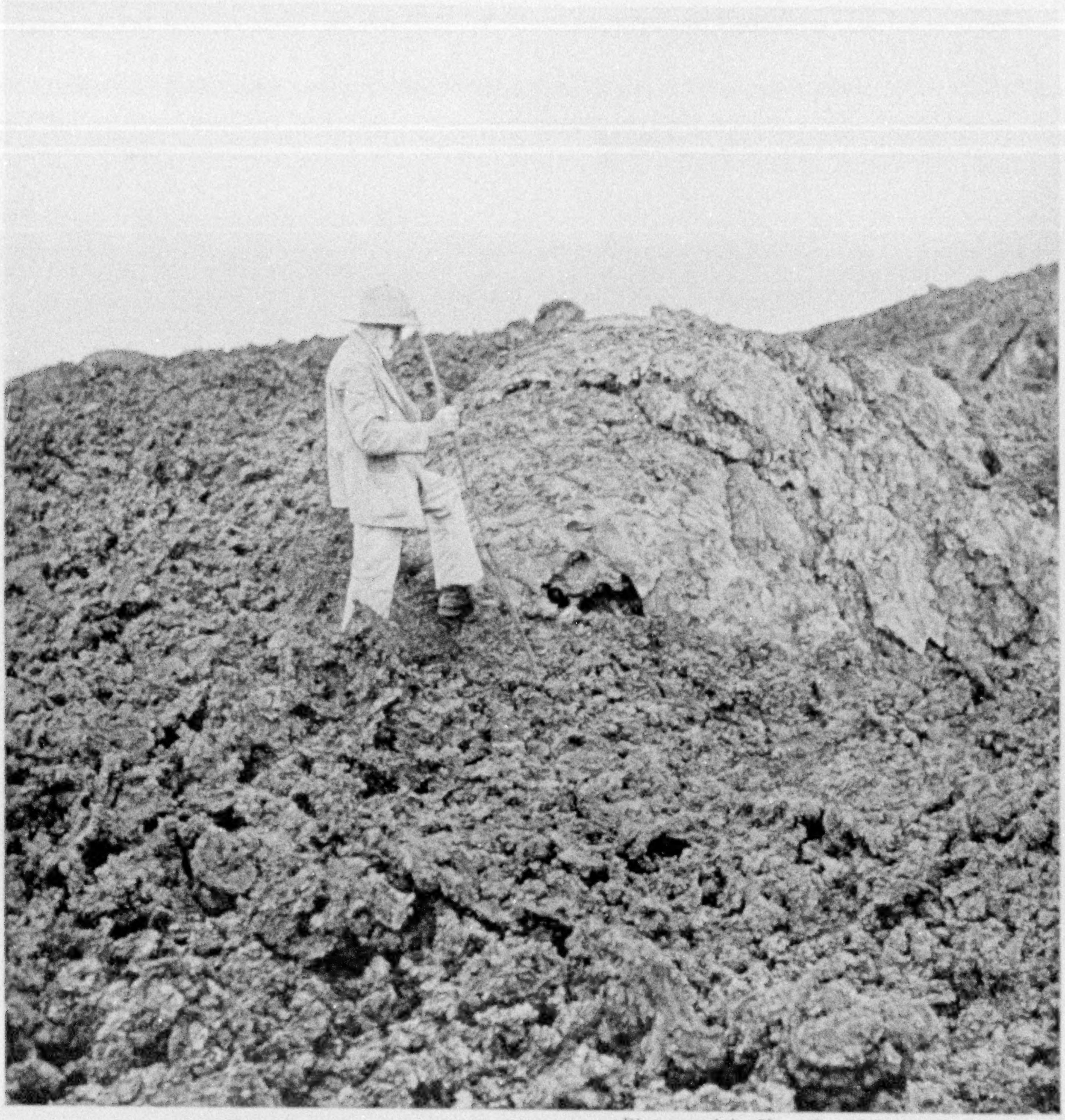
RED-HOT CREEPING TOES SLOWLY SPREADING OVER THE FLOOR OF HALEMAUMAU (EVERLASTING FIRE): ACTIVE CRATER OF KILAUEA



Photograph by Hawaiian Volcano Observatory

FOUNTAINING VENT NORTH OF HALEMAUMAU WHERE, ON NOVEMBER 1, THE LIQUID WELLED UP THROUGH THE GROUND SIMULTANEOUSLY WITH AN EARTHQUAKE

Like an artesian well, it sent floods in all directions.



Photograph by Hawaiian Volcano Observatory

ONE OF THE GREAT RAFTS IN THE AA LAVA OF THE ALIKA FLOW, MAUNA LOA

To the Hawaiian language scientists are indebted for the terms used to distinguish the two different kinds of volcanic lava. One type, resembling rough clinkers or slag from a furnace, is named AA (see pages 188, 209, 222); the other type, which is smooth and shiny glass, is known as pahoehoe (see pages 187, 210, and 234).

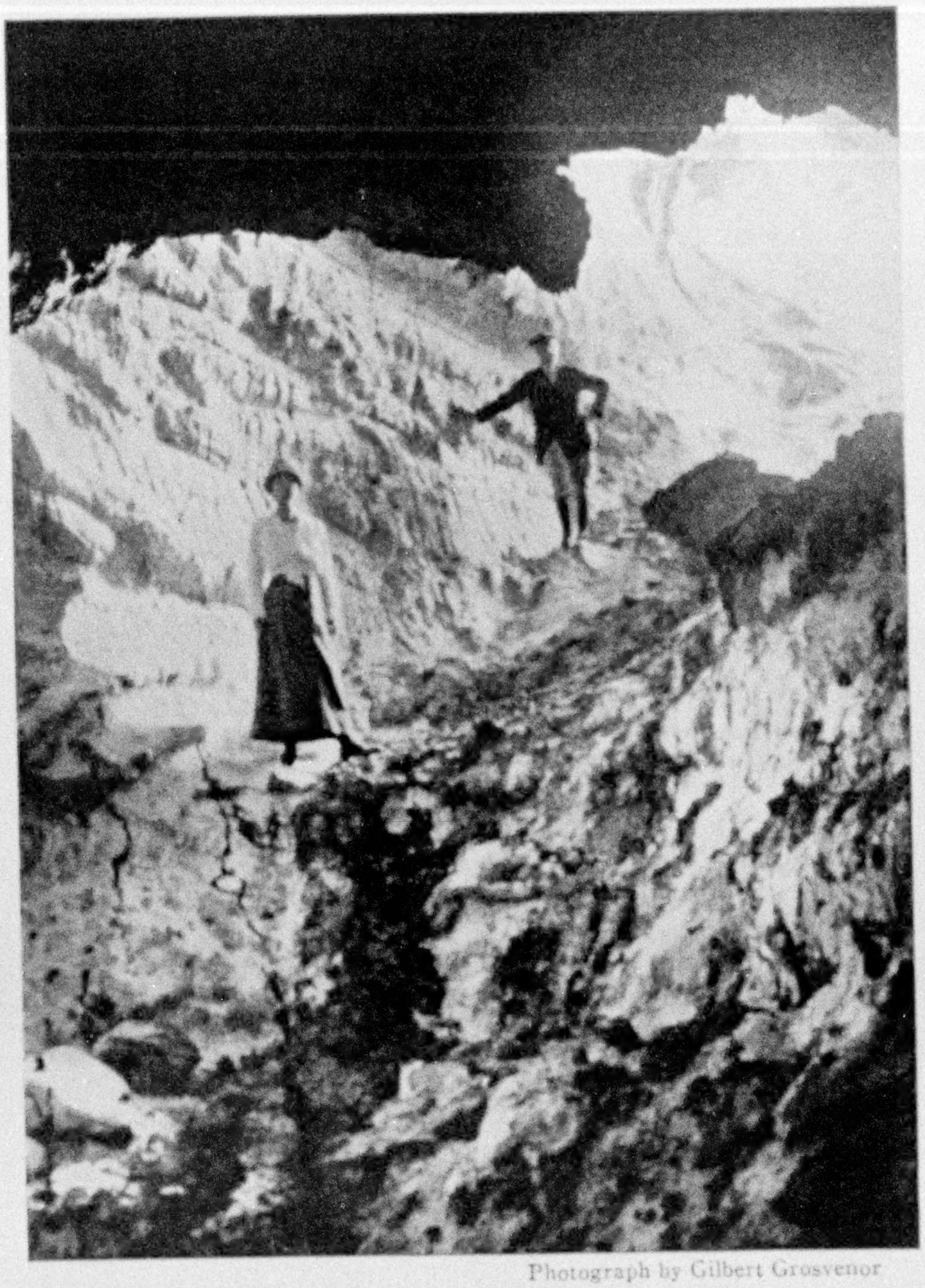
The ascent continued so gradual that we were hardly conscious of the fact that we were mounting with every step.

A few miles farther on we traversed a lumpy, rolling sheet of colored glass, extending as far as the eye could reach, glistening at times with the radiance of countless jewels, sparkling with the brilliance of diamonds and rubies and sapphires or softly glowing like black opals and iridescent pearls. The hoofs of our animals broke through this satin stream with a crunching sound, as if they were piercing the crust of frozen snow (see page 210).

Next we passed a perfectly symmetrical blood-red cone in a frozen jet-black shining sea of obsidian—a lovely sight—and a few hundred yards farther on a red cone and a black cone side by side.

An hour later we noted long tongues of brilliant red AA which had thrust across a field of yellow volcanic sand.

The goddess of the volcano, like all vigorous savages, delights in strong, positive colors. Thus each lava flow sharply



Photograph by Gilbert Grosvenor

INTERIOR VIEW OF THE TUBE, OR TUNNEL, THROUGH WHICH A FEW WEEKS EARLIER THE RIVER OF FIRE (COLOR PLATE V) HAD RUSHED

differs from its neighbors. As we crossed a jet-black flow of congealed lava, we skirted a bright red-brick cone, and in the distance clearly visible could trace the course of other flows in bronze, slate, pink, and chocolate.

The colors soften the sense of terrific desolation.

THE FORTITUDE OF ADMIRAL WILKES IS RECALLED

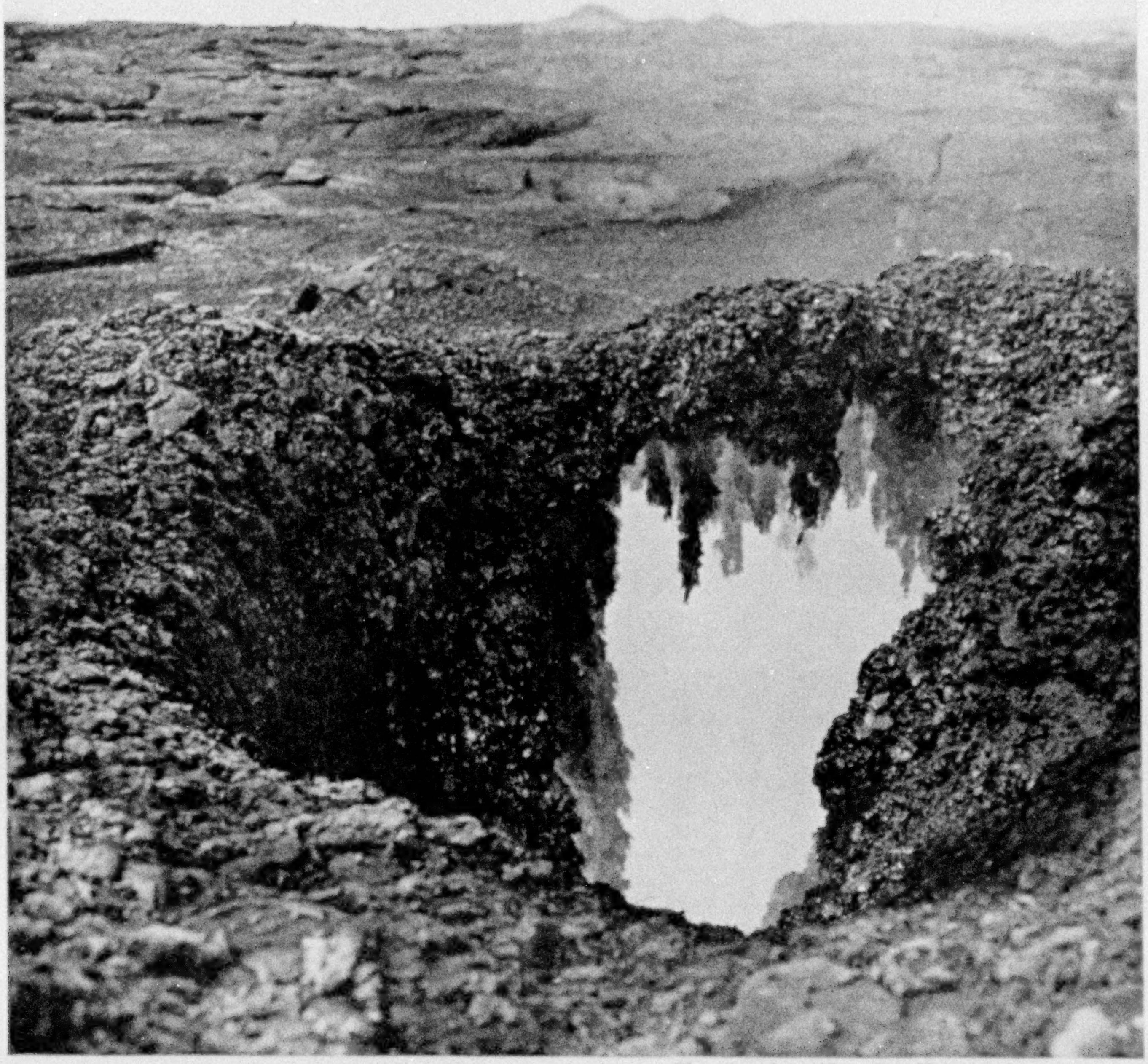
As we traveled through this frightful waste on a well-marked trail, comfortably on able mules, dismounting only when the trail became especially rough or our mules sank to their bellies in the powdered glass, our thoughts reverted with admiration and wonder to that U. S. Navy hero, Charles Wilkes, who 80 years before, without the assistance of such trusty animals as ours, had conducted a party of American officers and bluejackets to the crater's rim and camped on the cold, bleak, barren summit for three weeks in the depth of winter.

In his pursuit of knowledge, Admiral Wilkes was relentless and indifferent to physical feelings, and similarly inspired all associated with him. Since his time few have spent more than a night on the summit. Wilkes built a walled village on the crater's edge, and here for more than twenty days he resolutely conducted magnetic and pendulum observations. Often the cold was so intense in his tent that water froze "within a couple of feet of the fire, when it was giving out the most heat," and water in the bags froze under his pillow.

THE FOUNTAIN HEAD OF FOUR VOLCANIC MOUNTAINS

About noon we reached the edge of the crater. Several hundred feet below us stretched the crater floor, an extensive gray, slaty, hard surface, rather rough and exhibiting no signs of warmth or activity, except in the further corner, where some steam was slowly rising (see page 211). That gray floor temporarily capped a gusher that had been operating for thousands of years.

It was intensely interesting to behold



Photograph by Hawaiian Volcano Observatory

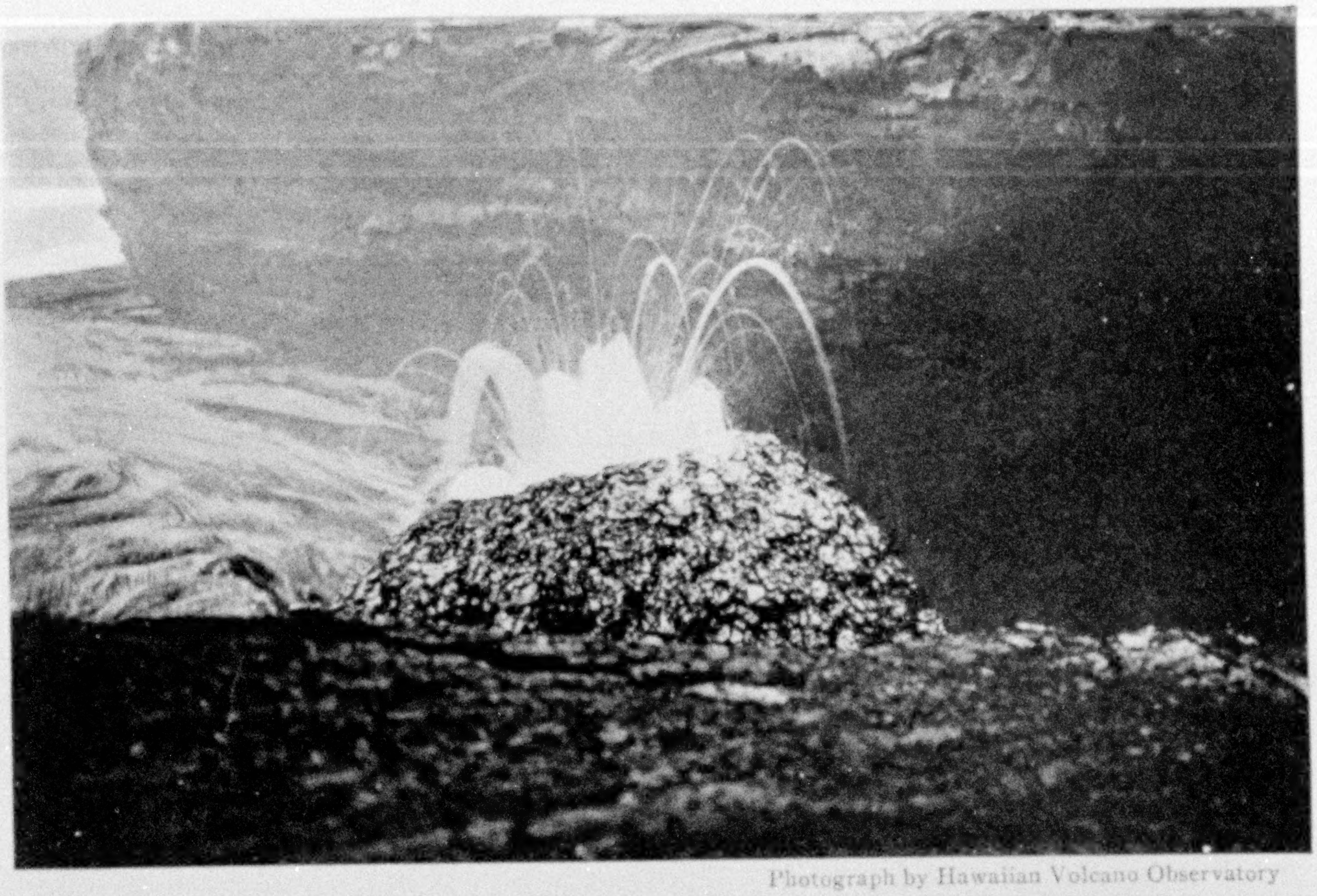
LOOKING INTO AN INCANDESCENT GROTTO

Lava was splashing below in bright yellow heat and gas-melted stalactites hung from the roof like bunches of fiery grapes.

the fountain head of the volcanic stream that had constructed the four great mountains forming the island—probably the most unusual group of volcanoes on earth.

From our present knowledge, geologists are inclined to believe that when this spouting stream, which originated many miles down in the bowels of the earth, had raised Mauna Kea to its present height of 13,823 feet, it could force itself no higher and, being compelled to seek outlets elsewhere, formed Hualalai, 8,269 feet, and Kilauea. Then it transferred its energies again and erected Mauna Loa, the giant of them all—a tremendous turtle-back 60 miles across and 200 miles in circumference at sea level.

Mauna Loa is very venerable, but still probably in its vigorous prime. It has become so lofty that when the fires inside would escape, the liquid now finds egress from the flanks rather than from the summit crater, and these flows radiate from the mountain like the spokes of a wheel (see map, page 183) and threaten to bury Kilauea.



Photograph by Hawaiian Volcano Observatory

A SPATTER CONE SPINNING PELE'S HAIR ON THE EDGE OF THE PIT OF KILAUEA

As the lava boils and spits, the wind snatches the threads of spume and scatters them broadcast. Thus the neighborhood becomes covered with cobwebs of glass.

"The cause of the steady upflow," Dr. Jaggar has stated, "may be a subsiding of the ocean's bottom all about, or it may be the elastic force contained within the liquid itself or its imprisoned gases."

"I can never hope again to witness so sublime a scene," wrote Admiral Wilkes in 1840. "The very idea of standing on the summit of one of the highest peaks in the midst of this vast ocean, in close proximity to a precipice of profound depth, overhanging an immense crater 'outrageous as a sea' with molten rock, would have been exciting even to a strong man; but the sensation was overpowering to one already exhausted by breathing the rarefied air and toiling over the lava which this huge caldron must have vomited forth in quantities sufficient to form a dome sixty miles in diameter and nearly three miles in height."

SOME DAY MAUNA LOA WILL BE ACCESSIBLE TO ALL

We could not linger more than an hour at the crater's rim, as it was essential to return to the half-way house before dark. As on the previous evening, the blanket of cloud, slowly forming at nightfall, enveloped the mountain below. This belt of cloud dissolved in the morning when the sun lifted, revealing Hilo 35 miles to the east and Kilauea, puffing away as vigorously as before, some 20 miles away.

Some day we hope that the marvelous experience which had been our privilege will be available to many. At present the excursion to the summit is not popular. For one who travels afoot the distances between rest-houses impose a tax that is dangerous, except for the most athletic; while those who would ride find the ranchers justly refuse to rent their mules for a journey that leaves the animals with feet and legs so badly cut by jagged lava and volcanic glass that they cannot be used again for weeks.

Later Mauna Loa will be made accessible by easy trails, hotels, and rest-houses, and be, like Etna, in Sicily, or Haleakala, on Maui, the common resort of tourists, alpinists, and the people of the Islands. Its wonderful forest glades, deep clefts, lava cones and pits, cliffs, vistas, and climates are at present unknown; and yet this volcanic height is one of the marvels of the world, unique among our national parks.

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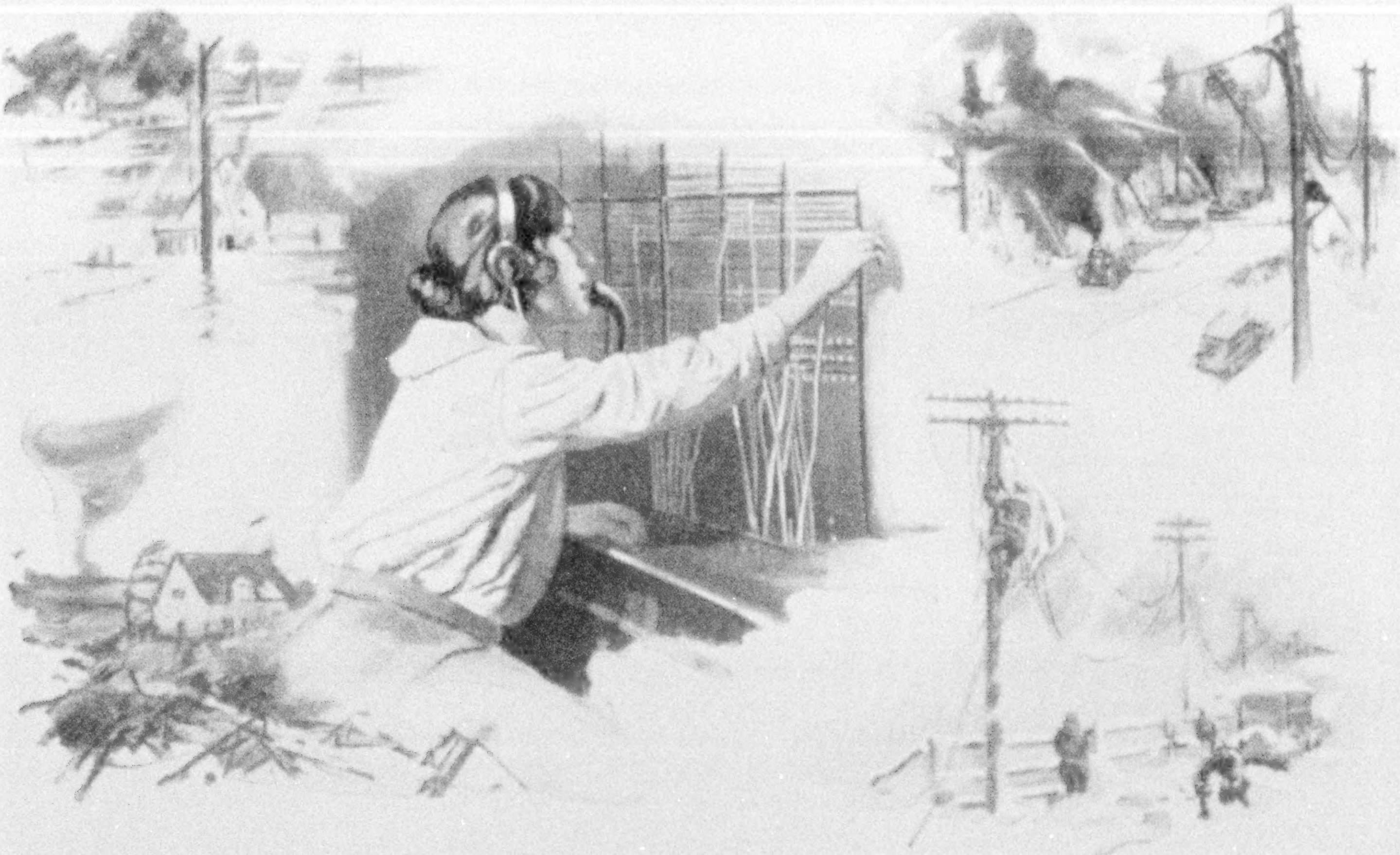

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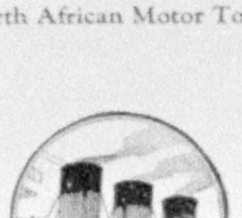

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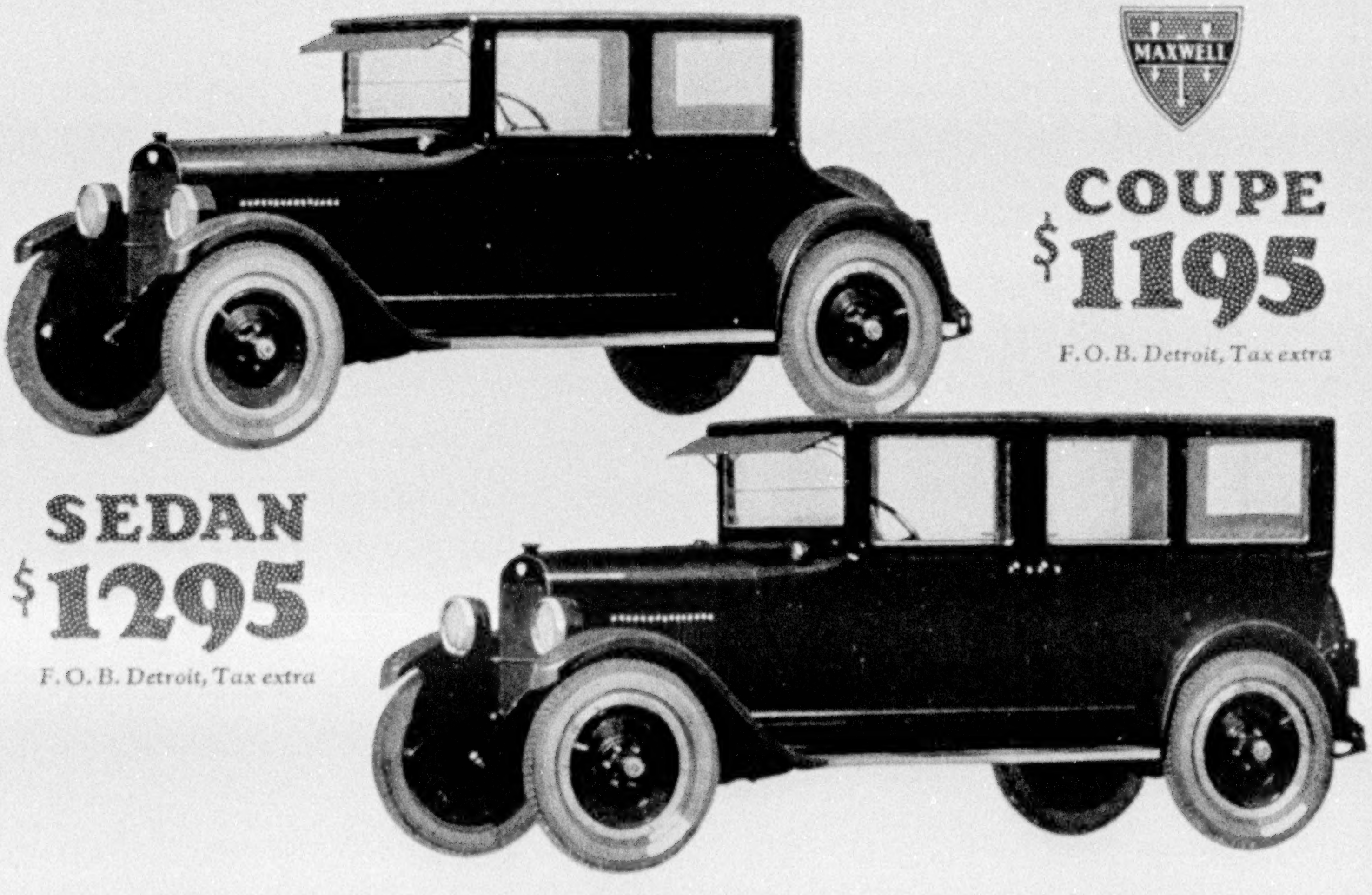

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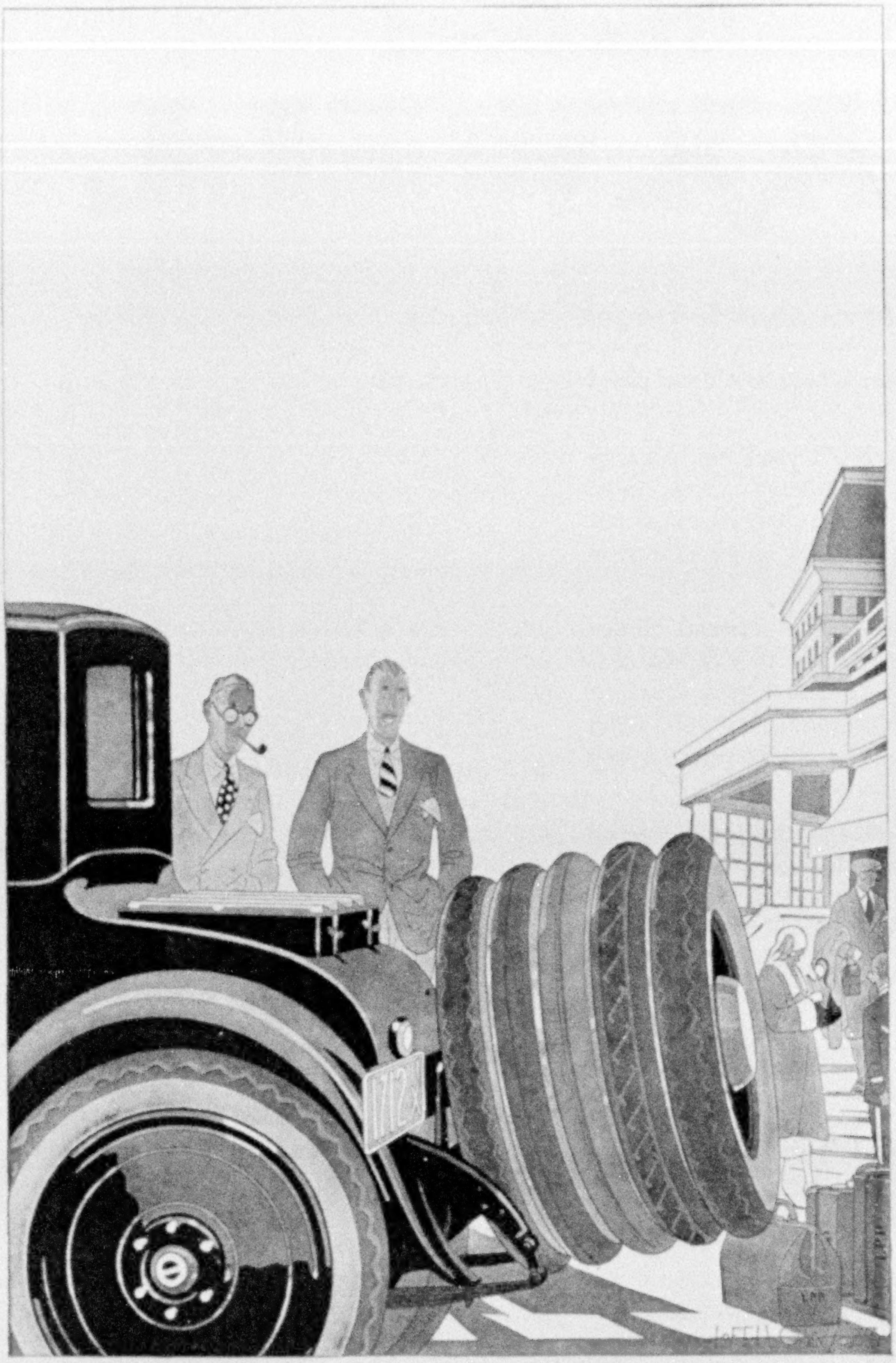

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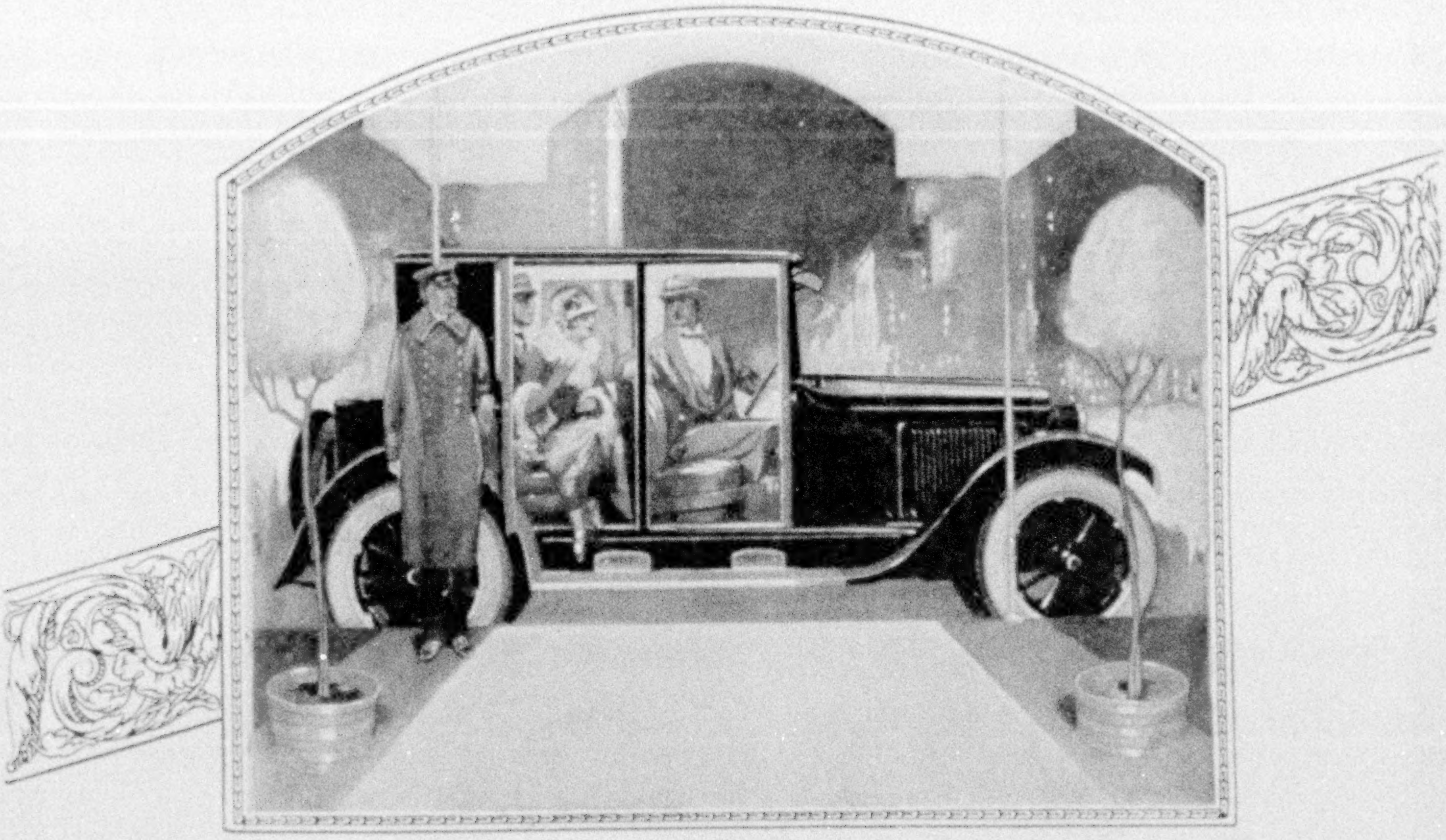

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An engine smooth as silk! Quiet! Quick! It actually improves with use. Immune from valve-grinding and the woes of carbon Amazingly sparing in its appetite for gasoline and oil. Owners report 50,000 miles and more without a single engine adjustment

An original body creation of steel, finished entirely in lustrous black. *Washable* Spanish upholstery. Doors *front* and *rear* provide easy exit and entrance without crawling over seats or feet. A motor car of consummate charm and infinite mileage.

Willys-Overland, Inc., Toledo, Ohio • • Willys-Overland Ltd., Toronto, Ont

Other models: 5-pass. Touring $1175, 2-pass. Roadster $1175, 7-pass. Touring $1325, 5-pass. Coupe Sedan De Luxe $1550, 5-pass. Sedan $1795, 5-pass. Sedan De Luxe $1895, 7-pass. Sedan $1995, all prices f.o.b. Toledo. We reserve the right to change prices and specifications without notice

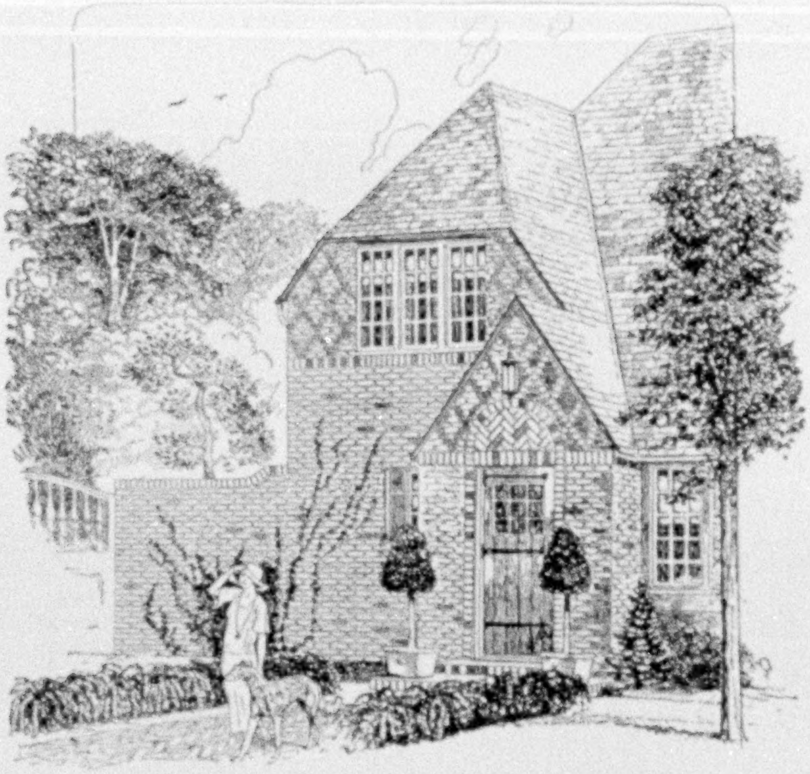
THE DAY OF THE KNIGHT IS HERE

WILLYS-KNIGHT

Coupe-Sedan

Standard

$1450



The Final Economy of the Face Brick House

THE final economy of the Face Brick house can be explained in a few words. It costs a little more to build, but it effects big savings every year of its long life. A significant fact for every home-builder! And responsible for the large increase in the number of Face Brick houses built in the last few years. Before you build, read "The Story of Brick." For your copy, address American Face Brick Association, 1737 Peoples Life Building, Chicago, Illinois.

Booklets you ought to have:

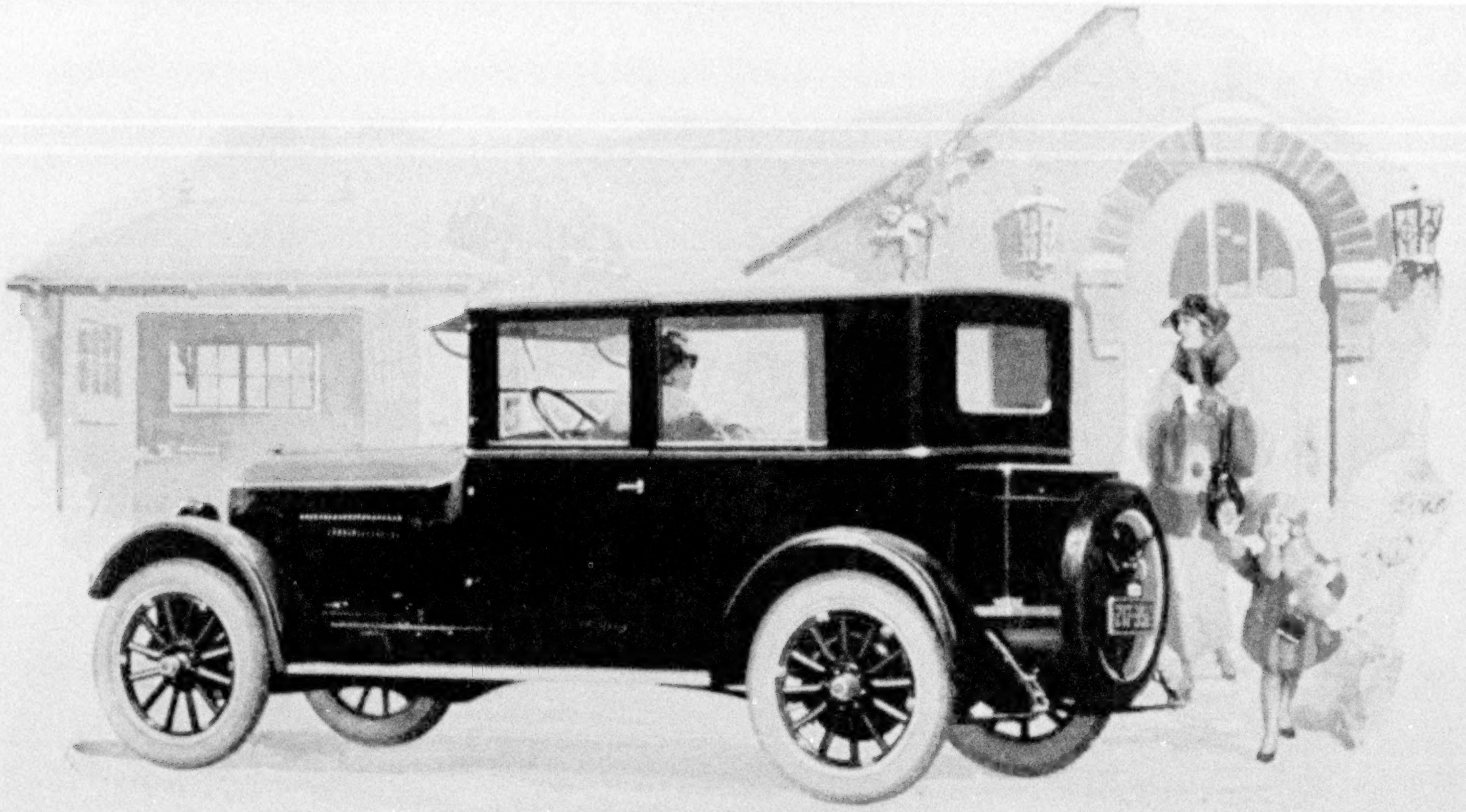
"The Story of Brick," a most artistic, illustrated book with indispensable information for anyone thinking of building. So interesting that it is used as a reader in a number of schools. Sent free. "Invaluable to home-builders. Information well worth $5.00," says one of hundreds of enthusiastic readers.

"Face Brick Bungalow and Small House Plans" embrace 96 designs of face brick bungalows and small houses. They are issued in four booklets, 3 to 4-room houses, 5-room houses, 6-room houses, and 7 to 8-room houses. The entire set for one dollar; any one of the books, 25 cents. Please send stamps or money order. "I would not part with them for a hundred times their cost. They are simply invaluable to me."

"The Home of Beauty" contains 50 designs of Face Brick houses, mostly two stories, selected from 350 designs submitted by architects in a nation-wide competition. Sent for 50 cents. "'The Home of Beauty' is far ahead of any book of house plans I have ever seen."

"The Home Fires" is a new book containing 20 attractive original fireplace designs, 25 pictures of fireplaces designed by well-known architects, and an article on proper fireplace construction. Sent for 25 cents. "We are truly delighted with this piece of literature."

IN ALL THE WORLD NO CAR LIKE THIS



In All the World No Brougham Like This

Baked Enamel Finish on Wood Frame—50 Horsepower Performance $1325

THIS New Jewett Six Brougham exactly suits those families who want a smart closed car at moderate cost. Think—a closed JEWETT SIX for five, at the cost of many open models of less ability!

Both front seats fold forward—easy entrance and exit, either side. Rear seat 46½ inches wide. Lots of leg room for the tallest. In fact, all Jewett models are as roomy inside as larger, cumbersome cars; and Jewett's convenient chassis size gives many traffic advantages.

No other car offers you a body built like this New Jewett Brougham. Each steel body panel is dipped three times in finest black enamel and baked—with a rub between each coat—then fastened to the wood frame. Wood, because wood eliminates drumming noises. This enamel finish stands the hardest wear. A wash brings out anew the gloss ALL OVER THE CAR!

Jewett is a sturdy six—not a "light" six. It has 6-inch-deep frame, Paige-type clutch and transmission; Paige-Timken axles front and rear; all-steel universal joints. Owners praise its dependability.

Jewett's big six 50 h.p. motor has 249 cu. inches piston displacement—40 per cent more than some "light" sixes. That's why all Jewett closed cars have "open car" performance. And this big motor STAYS GOOD! It is high-pressure oiled like the Paige and other finest quality cars.

This Brougham is a delight to women. They like the quiet shifting of gears, the gentle clutch. You can even change from high to second at 30 miles an hour.

In all the world no car like this. Jewett Six offers a combination of advantages and mechanical superiorities found in no other car at Jewett's price. See this new Brougham. Drive it. Test its ability.

Touring . . .	$1065	Sedan	$1495	De Luxe Touring	$1220
Brougham . . .	1325	De Luxe Roadster	1195	De Luxe Sedan .	1695

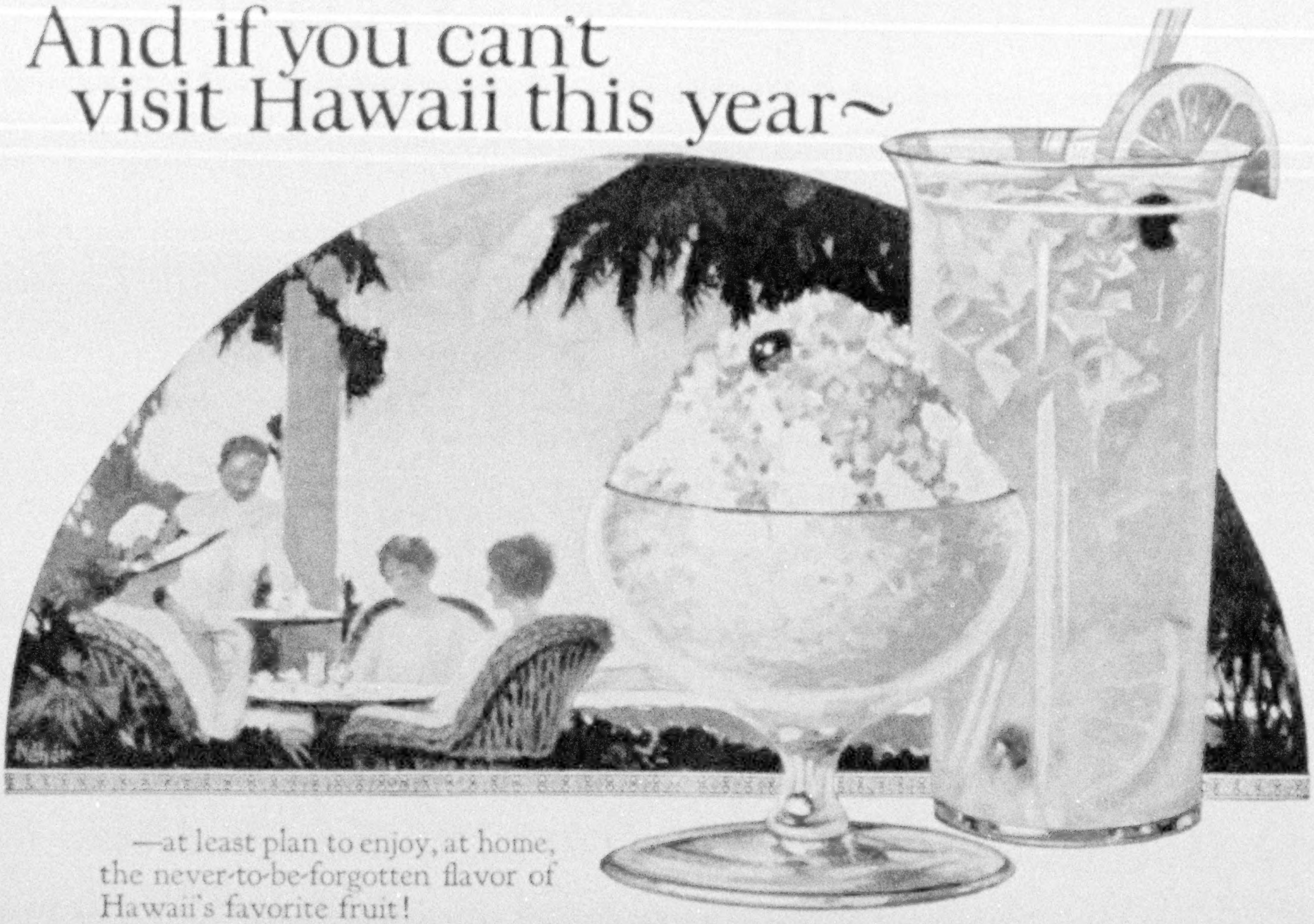
Prices at Detroit, Tax Extra

JEWETT SIX

PAIGE BUILT

XUM

And if you can't visit Hawaii this year~



—at least plan to enjoy, at home, the never-to-be-forgotten flavor of Hawaii's favorite fruit!

Serve canned Hawaiian Pineapple often—all year round—the *Sliced*, as a dessert and salad fruit just as it comes from the can—the *Crushed*, in pies, cakes, salads, sundaes, fruit-cocktails, and in a host of other tempting made-up dishes.

Both kinds are identical in quality and flavor—the same luscious, full-ripened fruit, grown on the same Hawaiian plantations—packed in the same modern canneries the day it is picked.

Order a supply of both kinds from your grocer today. And write for free recipe book. Address Department 79.

ASSOCIATION OF HAWAIIAN PINEAPPLE CANNERS
451 Montgomery St., San Francisco, Calif.

For Instance, Try These Proven Recipes—

PINEAPPLE SUNDAE

Boil 1½ cups Crushed Hawaiian Pineapple, ¾ cup sugar, ½ cup water and 1 teaspoon lemon juice for ten minutes. Chill and serve on ice cream. Garnish with a candied cherry.

SOCIETY PUNCH

Mix 3 cups sugar and 4 cups water and boil for 5 minutes. Chill and add 4 cups syrup drained from Crushed Hawaiian Pineapple, the juice from 8 oranges and 4 cups ice water. Add 4 oranges, sliced very thin without removing rind, 2 cups Crushed Hawaiian Pineapple from which syrup has been drained and ½ cup maraschino cherries. This will serve 25 persons.

PINEAPPLE MERINGUE PIE

Mix ⅓ cup sugar, ⅛ teaspoon salt and 2 tablespoons cornstarch and slowly add 1½ cups hot milk. Cook in a double boiler until thick and cornstarch is thoroughly cooked, (about 40 minutes). Pour onto 2 egg yolks, return to double boiler and cook until the eggs thicken, (about 3 minutes). Cool and add 1 cup well-drained Crushed Hawaiian Pineapple and ½ teaspoon vanilla. Pour into a baked crust and cover with a meringue made of 2 stiffly beaten egg whites and 2 tablespoons powdered sugar. Brown quickly in a hot oven.

HONOLULU SHORTCAKE

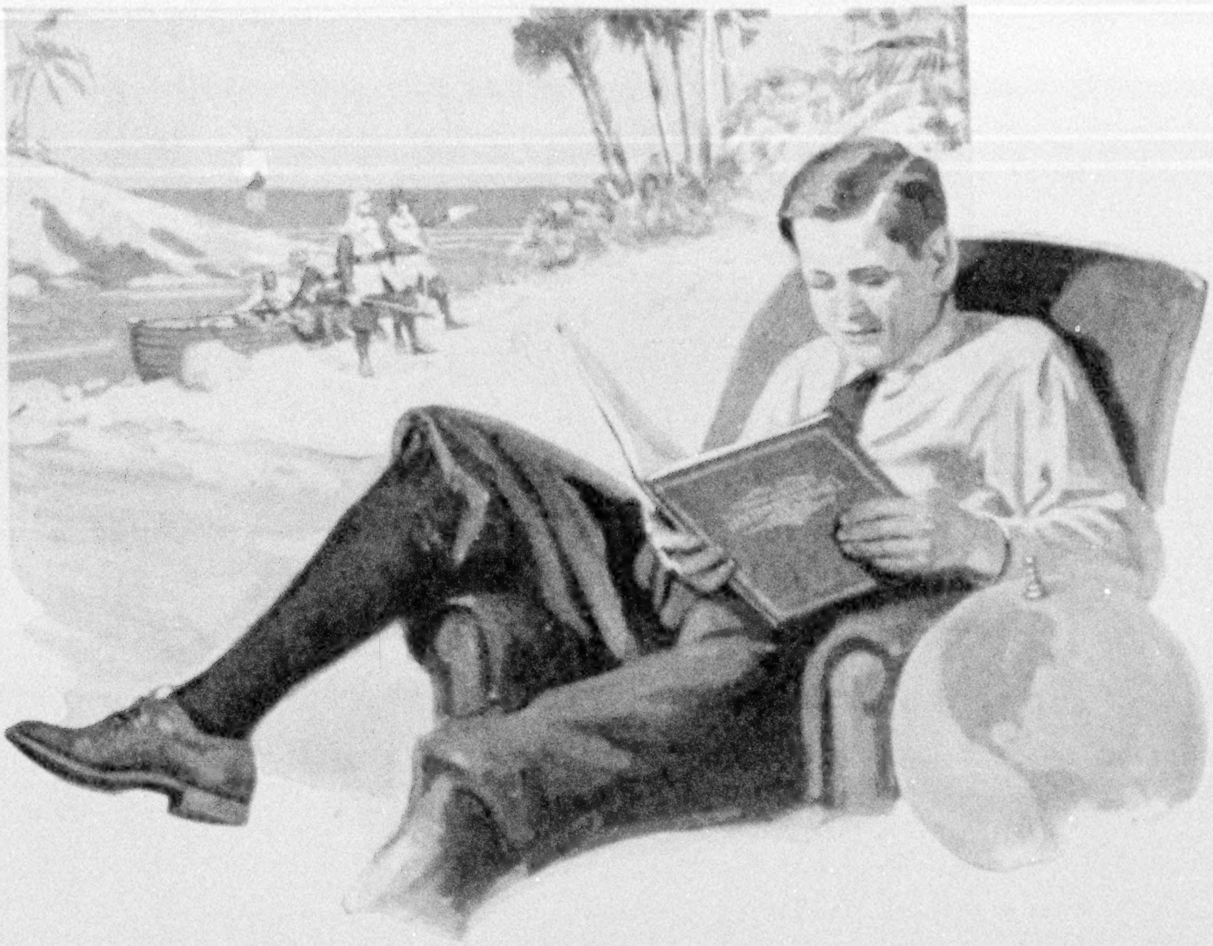
Spread well-drained Crushed Hawaiian Pineapple thickly between layers of plain cake, cut in squares. Serve with whipped cream.

SOUTH SEA ISLAND FRUIT CUP

Remove the skins from 3 bananas, cut in quarters lengthwise and slice in quarter-inch slices. Arrange in cocktail or sherbet glasses. Pour ice-cold Crushed Hawaiian Pineapple over each allowing about ¼ cup to each serving. Garnish with a candied cherry and serve immediately.

HAWAIIAN *Crushed* PINEAPPLE

CANNED
ready to use



"The thoughts of youth are long, long thoughts—"

Distant seas and distant shores, strange lands and customs and people. Boyish dreams, always reaching over the horizon! Out of such thoughts as these grew the voyages of the explorers, and the maps of the world.

Boys still build their imaginary strongholds on hidden harbors, and embark on voyages of adventure with the heroes of history and literature. Give these normal, healthy thoughts a background in good maps and globes—which are simply maps in their true form. The natural interest which prompts their study now will result in a store of information which will be applied in later life.

RAND McNALLY Maps are guiding the new adventurers, the aviators of the United States Army, in their record-breaking flights. They are making motorists at home on distant highways. They are controlling the rudders of ships on all the seven seas. On them the campaigns of business are planned and watched. They are standard equipment in the schools of the land.

At home, they banish horizon lines, giving a deeper understanding of the history daily being made.

An organization world-wide in scope, incessantly watchful and incessantly active, has made the word "maps," wherever heard, mean RAND McNALLY.

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Take a Kodak with you

Whether city stroll or country hike, winter sets the stage for a picture worth the making. And the Kodak way is the easy way and one that's fun from the start.

Autographic Kodaks *$6.50 up*

At your dealer's

Eastman Kodak Company, Rochester, N.Y., *The Kodak City*

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Offers a Finer Coach on a New Super-Six Chassis

The Coach
$1475

New Models

Speedster - - - -	$1350
7-Pass. Phaeton - - -	1425
Coach - - - - - -	1475
Sedan - - - - - - -	1895

Freight and Tax Extra

At almost open car cost the new Hudson Coach gives all the utility you can get in any closed car, enhanced by an even more attractive and comfortable Coach body. You will note at once its greater beauty, more spacious seating, wider doors, and longer body. The lines are new, too. With this finer body you also get the advancements of a new Super-Six chassis. It has the reliability and economy of maintenance and operation for which everyone knows Hudson. To these it adds a new degree of smoothness in performance that will surprise and delight even those who best know the past Hudsons.

Hudson Motor Car Company
Detroit, Michigan

Paint

Velumina

The Wall Paint You Can Wash

Velumina-painted walls—soft, warm colors—that can be *washed*

TIME cannot mar the beauty, the simple refinement of velvet-soft Velumina-painted walls. They are coated with a non-porous film which the attacks of dirt and grime cannot penetrate. Even grease does not harm Velumina. Finger-prints and stains that ruin the appearance of ordinary wall coverings can be washed off with plain soap and water.

Architects and decorators recognize the wonderful beauty and economy of Velumina. They know that it greatly aids in proper light-diffusion.

Velumina is made in sixteen perfect tones and white. It is a "Pittsburgh Proof Product." You will find the same high standard quality in other "Pittsburgh Proof Products," among them Pitcairn Waterspar Varnish and Sun-Proof Paint. Whatever you need in the way of glass, paint, brushes or varnish the Pittsburgh Plate Glass Company has a product that will fill your requirements exactly. For sale by quality dealers everywhere. The Pittsburgh Plate Glass Company's paint and varnish advisory board, made up of paint and varnish experts, will be glad to discuss with any manufacturer unusual paint and varnish problems. This service carries no obligation. Write for booklet describing it.

"What to do and How to do it"—a guide to better homes, is a book that answers a host of questions on home decoration and arrangement. It tells how to make the most of what you have—how to spend to the greatest advantage. Send ten cents to the Pittsburgh Plate Glass Co., Dept. C, Milwaukee, Wis., and your copy will be mailed at once.

PITTSBURGH PLATE GLASS CO.

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Varnish

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Fits the Finest Homes or Most Modest Incomes

Consider the evident high quality of this all-year family car, and its remarkable price—then you can understand why it has been necessary for us to double production facilities this year.

Many families already owning the highest priced cars, also own a Chevrolet Sedan or Coupé. They find it not only consistent in style and general quality with their social position, but also astonishingly economical to operate.

Those of more limited means take justifiable pride in the ownership of this distinguished car, which is nevertheless so easy to buy and maintain.

Thousands of pleased owners will tell you a Chevrolet offers the best dollar value of any car made.

Your own requirements for economical transportation will determine your choice of models.

Any Chevrolet dealer will explain their many points of superiority.

Chevrolet Motor Company, Detroit, Mich.

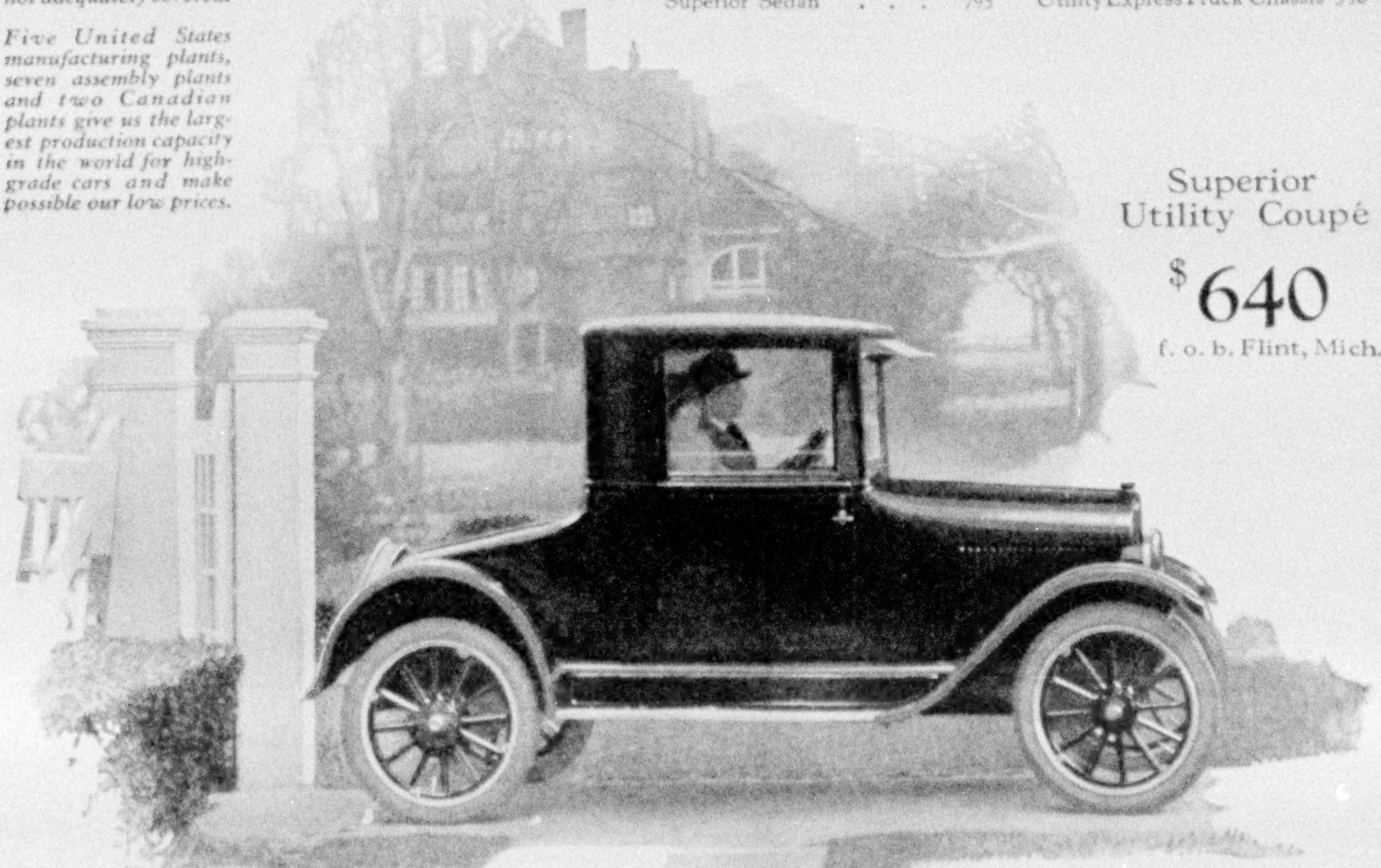
Division of General Motors Corporation

Chevrolet Dealers and Service Stations everywhere. Applications will be considered from high-grade dealers only, for territory not adequately covered.

Five United States manufacturing plants, seven assembly plants and two Canadian plants give us the largest production capacity in the world for high-grade cars and make possible our low prices.

Prices f. o. b. Flint, Michigan

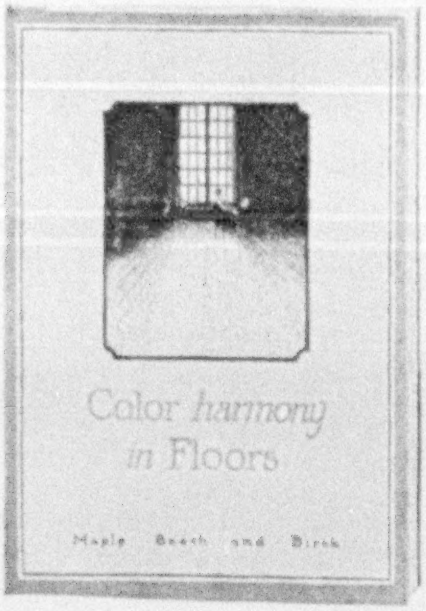
		Commercial Cars	
Superior Roadster	$490	Superior Commercial Chassis	$395
Superior Touring	495	Superior Light Delivery	495
Superior Utility Coupe	640	Utility Express Truck Chassis	550
Superior Sedan	795		



Superior Utility Coupé

$640

f. o. b. Flint, Mich.



If you but knew what's in this book

It would make your home more beautiful — help you conform the decorative scheme of each room to the modern style — open new and delightful possibilities of harmonizing your floors with your walls and woodwork, furniture and tapestries.

With Maple, Beech or Birch flooring, you can have a floor of "captive sunlight" — or a floor as dark as twilight — a conservative color, or a color which fits the requirements of the ultra modern school of interior decoration.

All the possibilities are interestingly illustrated in "COLOR HARMONY IN FLOORS" — ask your architect or retail lumber dealer, or write us and receive a copy with our compliments.

MAPLE FLOORING MANUFACTURERS ASSOCIATION
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Floor *with* Maple
Beech *or* Birch

Guaranteed Floorings

The letters **MFMA** on Maple, Beech or Birch flooring signify that the flooring is standardized and guaranteed by the Maple Flooring Manufacturers Association, whose members must attain and maintain the highest standards of manufacture and adhere to manufacturing and grading rules which economically conserve every particle of these remarkable woods. This trade-mark is for your protection. Look for it on the flooring you use.

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has incomparable *Tone*—the one quality above all others which makes a real piano. The exquisite tone of the Vose Grand distinguishes it from all other pianos.

We Challenge Comparisons. Write for beautifully illustrated catalog and floor pattern of the Vose Grand; also our easy payment plan.

Vose & Sons Piano Co., 146 Boylston St., Boston

VOSE

A Garden Full of Gladioli for $2.00

The Gladiolus is one of the most satisfactory flowers grown, and there is no reason why every family cannot enjoy this grand flower—it is as easy to grow as the potato.

Blooms from July to frost if you plant a few bulbs each month from April to July.

For **Two Dollars** we will send **50 Bulbs** of our **Grand Prize** Mixture, which covers every conceivable shade in the Gladiolus kingdom.

Each year we sell thousands of these bulbs and have received numerous testimonials as to their merits.

Order Your Bulbs Now, so as to have them to plant when you begin making your garden.

Simple cultural directions with every package

Mail this advertisement with check, money order, cash, or stamps, and secure this splendid collection, sent prepaid to any point in the U. S. east of the Mississippi. **For points West and Canada, kindly add 25c. to cover cost of delivery.**

Our 1924 Spring Seed Annual sent on request

Stumpp & Walter Co

30 and 32 Barclay Street New York

DODGE BROTHERS
TYPE-B SEDAN

To the admirable sturdiness and all-year protection of this Sedan, Dodge Brothers have added refinements which further enhance its value and desirability.

The car is long and low, with deep seats and abundant leg room. New springs—underslung in the rear—add immeasurably to the comfort of riding.

With its semi-drum type head lamps, tasteful hardware and flowing body lines, the Type-B Sedan will distinctly appeal to those who demand beauty as well as utility in the car they drive.

The price is $1250 f. o. b. Detroit

XUM

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A Warm House When You Arise

This Easy Inexpensive Way

For healthy rest, sleep with windows open. But keep the rest of the house warm. Chamberlin Inside Door Bottoms enable you to admit fresh air to any part of the house, while sealing all other parts against drafts.

Try This Experiment

Open your bedroom windows. Close the door, then place your hand at the crack between the bottom of the door and floor. Note the draft of cold air which rushes through the crack into the hall.

Try this at the attic and basement as well. There will be a draft at each. It goes on all night from bedrooms, constantly from the basement, while warm air escapes to the unused attic. That is why bath and breakfast rooms are almost always cold in the morning. And that explains why the temperature remains too far below normal until 10 or 11 o'clock every day during the winter.

Men don't notice this much. They are away usually in a rush. But women and children do. They contract colds—suffer uselessly.

Inside Door Bottoms End All This

Send the coupon below or write us for an estimate on the cost of equipping your home with inside door bottoms.

We gladly furnish free estimates covering the cost of installing weather strips or inside door bottoms or both in your home. When installed they are guaranteed for the life of the building. Simply mail the coupon. It costs nothing to learn how low the price of early morning comfort and coal saving.

Chamberlin Metal Weather Strip Co., Detroit, Mich.

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Eng. Dept. A-7

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Write for a copy to-day—it gives my personal cultural instructions.

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The Originator of The Ruffled Gladiolus

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"All that is worth seeing Seen as it should be seen"

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- Habanera (Carmen)
- Barcarolle (Tales of Hoffman)
- My Heart at Thy Sweet Voice (Samson and Delilah)
- Anvil Chorus (Il Trovatore)
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—Each one beautifully sung by a great artist; eight full-size ten-inch records of highest quality. What would you consider a *real* bargain?

OUR price is so low that if we displayed it in large type you would suspect that something must be wrong. Already, however, tens of thousands of these records have been sent to music lovers ON TRIAL with the result that our mail is literally packed with letters praising the quality, tone, and low price, ordering additional sets and enclosing the names of friends who want them!

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Send no money. Let us mail these records to you for 10 days' trial. Deposit $2.98, plus delivery charge with postman, when the insured package arrives, then play each record on YOUR machine in YOUR home. If not pleased with your bargain YOUR MONEY WILL BE REFUNDED at once. Reference, Manufacturers' Trust Company of New York or any magazine. Mail the coupon NOW—before the present supply is exhausted.

NATIONAL MUSIC LOVERS, INC.

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Please send me your collection of "16 World-Famous Operatic Songs." I will give the postman $2.98 plus few cents delivery charges on arrival. This is not to be considered a purchase, however. If the records do not come up to my expectation, I reserve the right to return them at any time within 10 days and you will refund my money at once.

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☐ If you like dance hits you may also care to have the four latest and biggest Fox Trot hits recorded by famous Broadway Dance orchestras. These have been placed on two TEN-INCH "National" Records and include the following: "I Love You," "What Do You Do Sunday, Mary?" "Annabelle," and "Somebody's Wrong." If you care to have these Fox Trots in ADDITION to the set of Grand Opera Songs place an X in the square at the left. The price is only 89c for all four selections. SOLD ONLY with the Opera Sets—not sold separately.

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We Pay the Freight

You can buy all the materials for a complete home direct from the manufacturer and save four profits on the lumber, millwork, hardware, labor.

6-Room Aladdin $695

Living room, dining room, 2 bedrooms, kitchen, bath. 4 other plans, some with pantries, dining alcoves, grade and inside cellar entrances. Get free Aladdin Catalog.

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Aladdin catalog contains seven different plans of this house; some with inset porches, grade and inside cellar entrances, two and three bedrooms.

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7-Room Aladdin $1,230

Typical American home with exposed rafters, shingled gables, and plenty of window ventilation Grade cellar entrance, three bedrooms, four clothes closets and large bath.

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Dutch Colonial with full ceilings first and second floors. 14' x 22' living room, large dining room, kitchen, three bedrooms, bath, linen and clothes closets; grade cellar entrance.

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Dutch Colonial for wide inside lots or narrow corner lots. Full ceiling heights entire second floor, sewing ro m, columned and inset front entrance.

Price includes all lumber cut to fit; highest grade interior woodwork, siding, flooring, windows, doors, glass, paints, hardware, nails, lath, roofing, with complete instructions and drawings. Freight paid to your station. Permanent Homes—NOT PORTABLE. Many styles to choose from. Write nearest mill today for FREE Money-Saving Aladdin Catalog No. 356.

The ALADDIN Co., BAY CITY, MICHIGAN

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ITS readers are the men, women, and children of the *Solid Families* of the Nation. As members of the National Geographic Society, they are more than mere subscribers to a periodical—have a very real, proprietary interest in the publication. They realize that all income from the Magazine is used to further the educational projects of their humanitarian organization. It is not surprising, therefore, that they usually speak of *"Our Magazine—The Geographic."*

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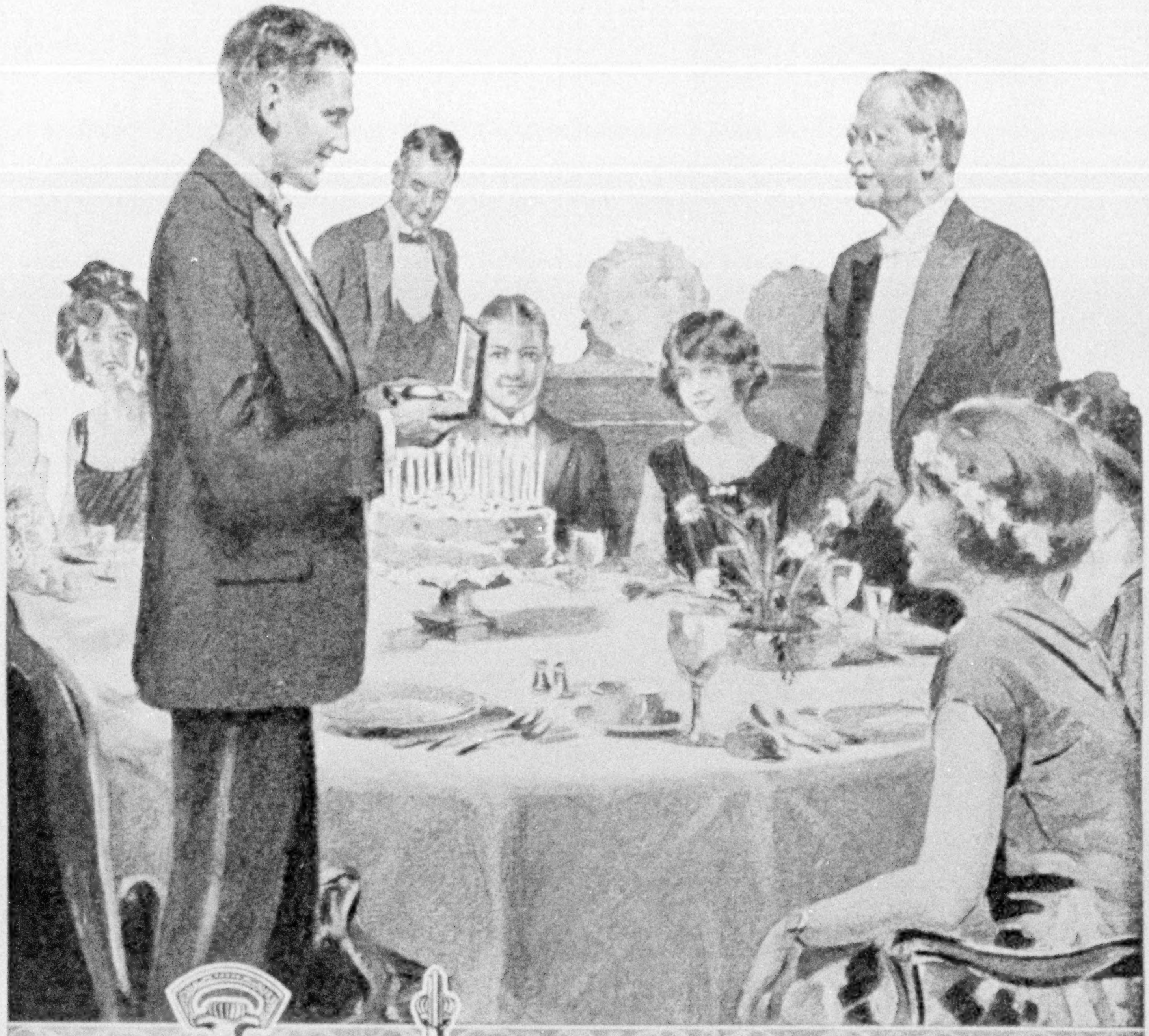
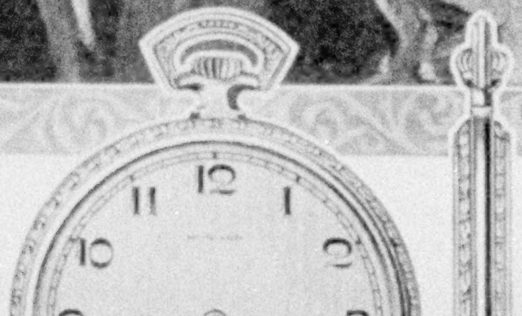
Has your Advertising Analyst Studied Our Detailed Analysis of Circulation?

The National Geographic Magazine

Washington, D. C.





"The thrill that comes once in a lifetime"

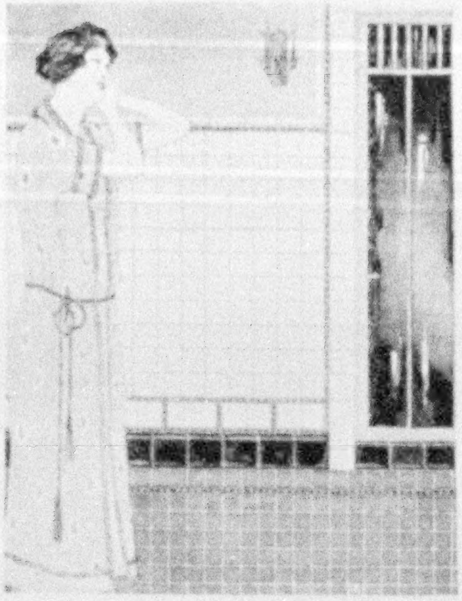
On your boy's birthday give him as good a watch as money can buy — a Howard! Give him a watch that will be as good in the years to come as it has been in the years gone by—the Howard!

When at eighteen or twenty-one he receives his first really good watch, let it be one that will give him "the thrill that comes once in a lifetime."

Howard Watches are made in various sizes and range in price from $63 to $150. Call on a Howard jeweler in your vicinity — he is a good man to know.

The HOWARD WATCH

THE KEYSTONE WATCH CASE COMPANY
Established 1853
New York Chicago Cincinnati San Francisco



Beautiful TILES

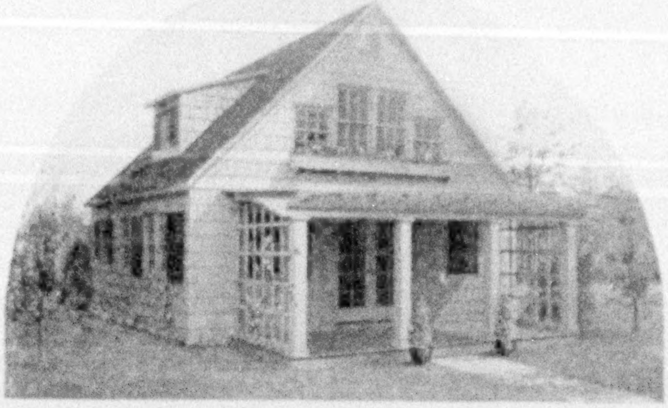
For the shower — whose growing popularity is one of the marked features of modern home building—Tile is the proper material.

Tiles in the shower and Tiles on the floor and walls of the bathroom itself give unlimited opportunity for the expression of ideas in color, pattern and design. The practical service of Tiles is also a great advantage.

Consult your architect and dealer about Tiles, or write to

Associated Tile Manufacturers

350 7th Ave., Beaver Falls, Pa.



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The Bossert "Ready-Cut" plan saves you architect's fees and at least 75% of the usual expenses of erecting. You are furnished with all plans and specifications together with the lumber, millwork, plaster-board, hardware, paint and varnish.

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Send 20c for Catalog

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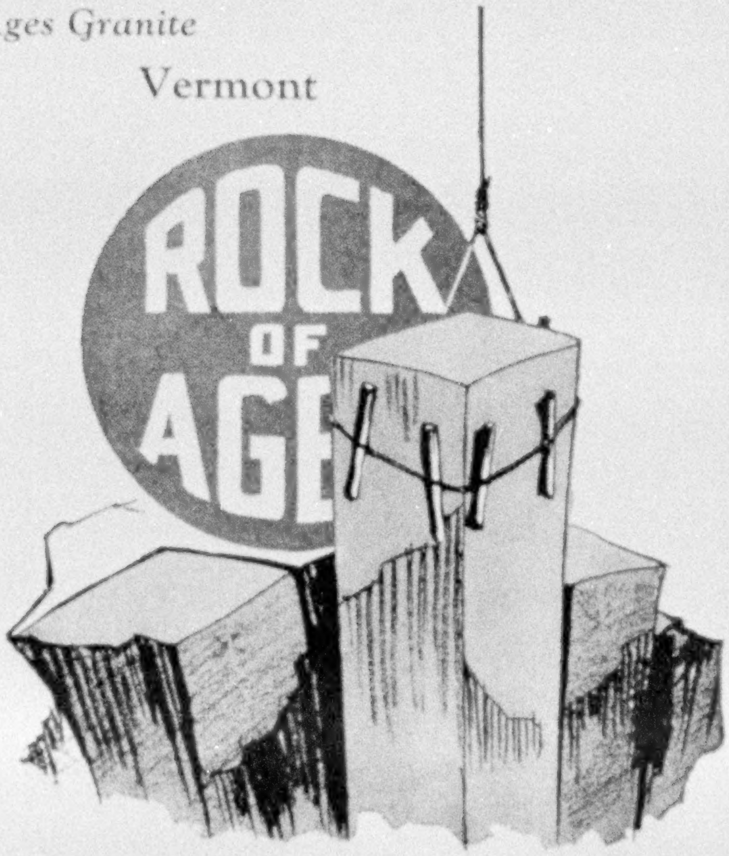

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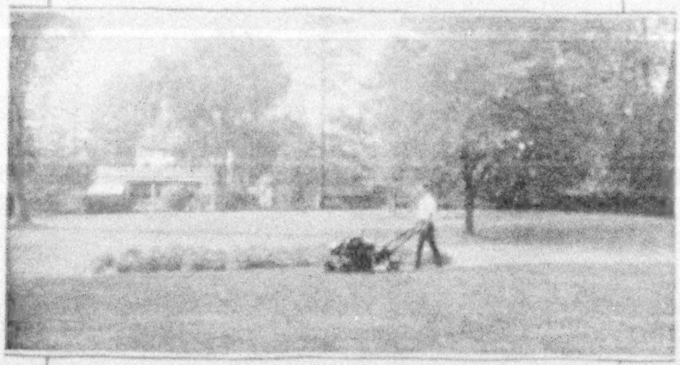

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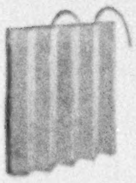

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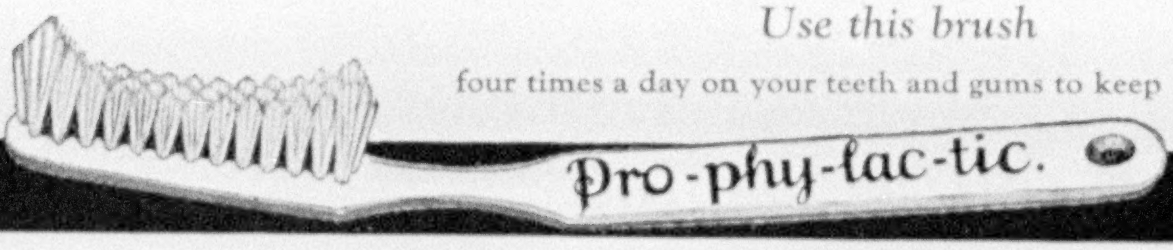

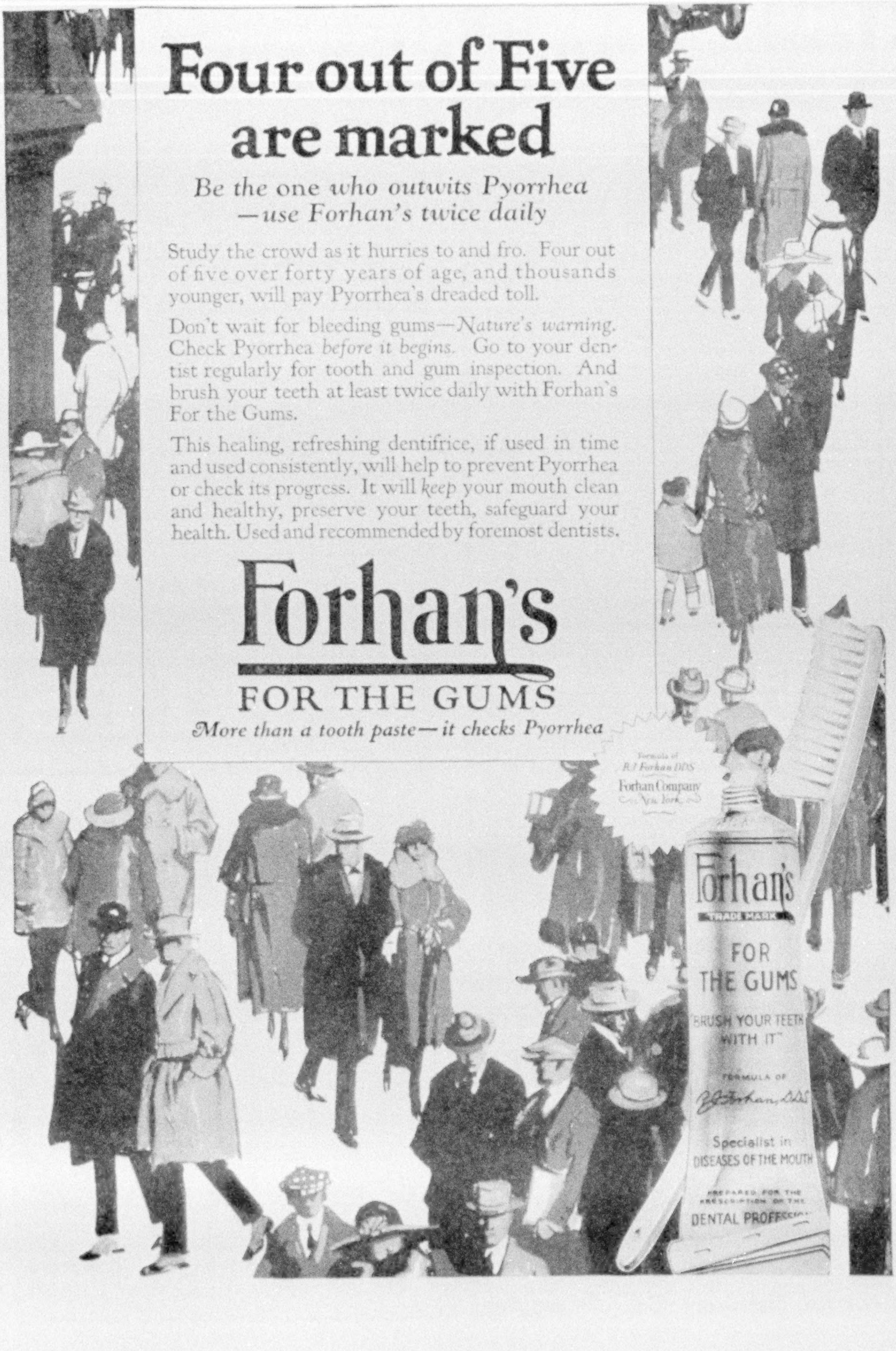
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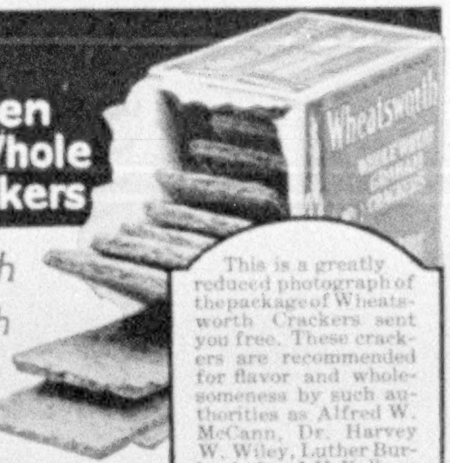

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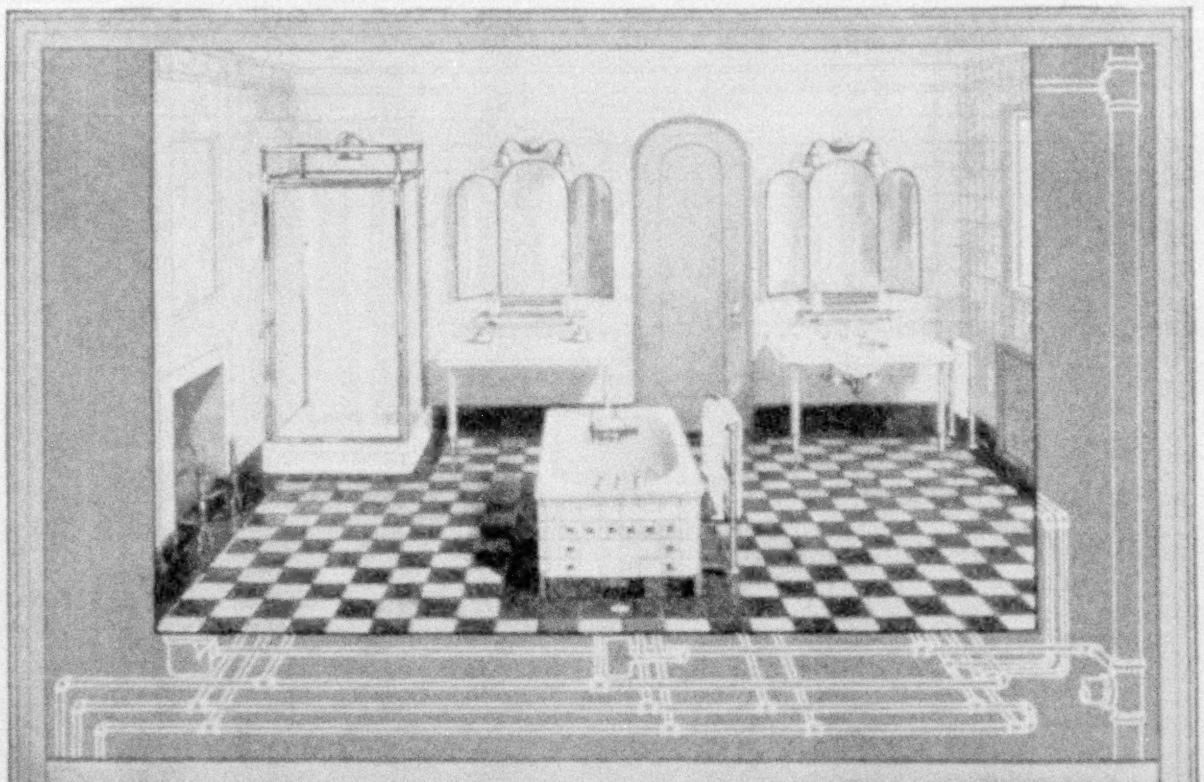

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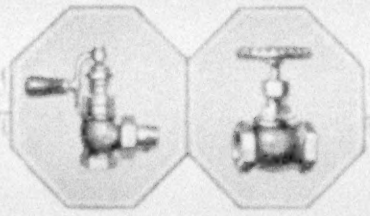

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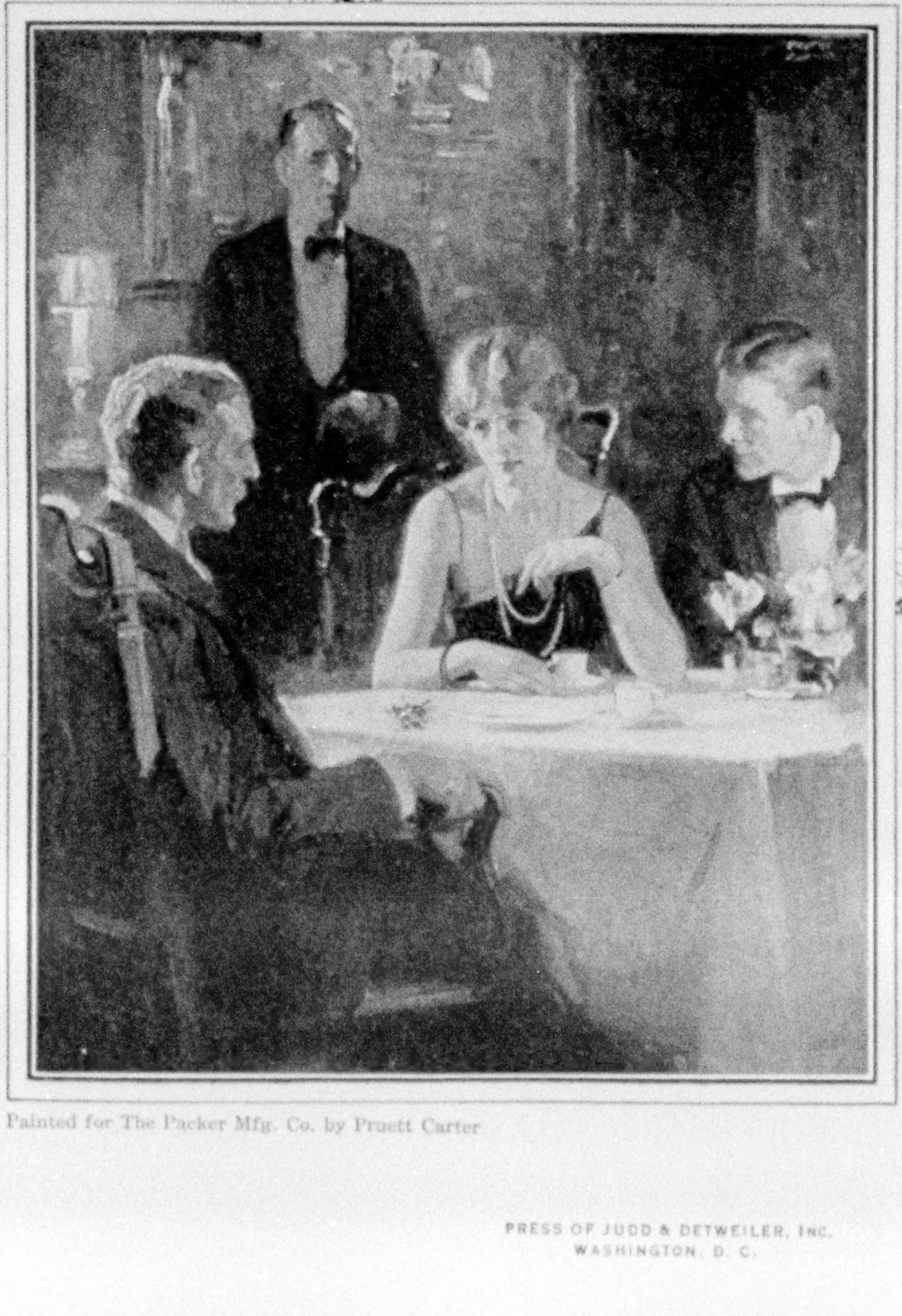

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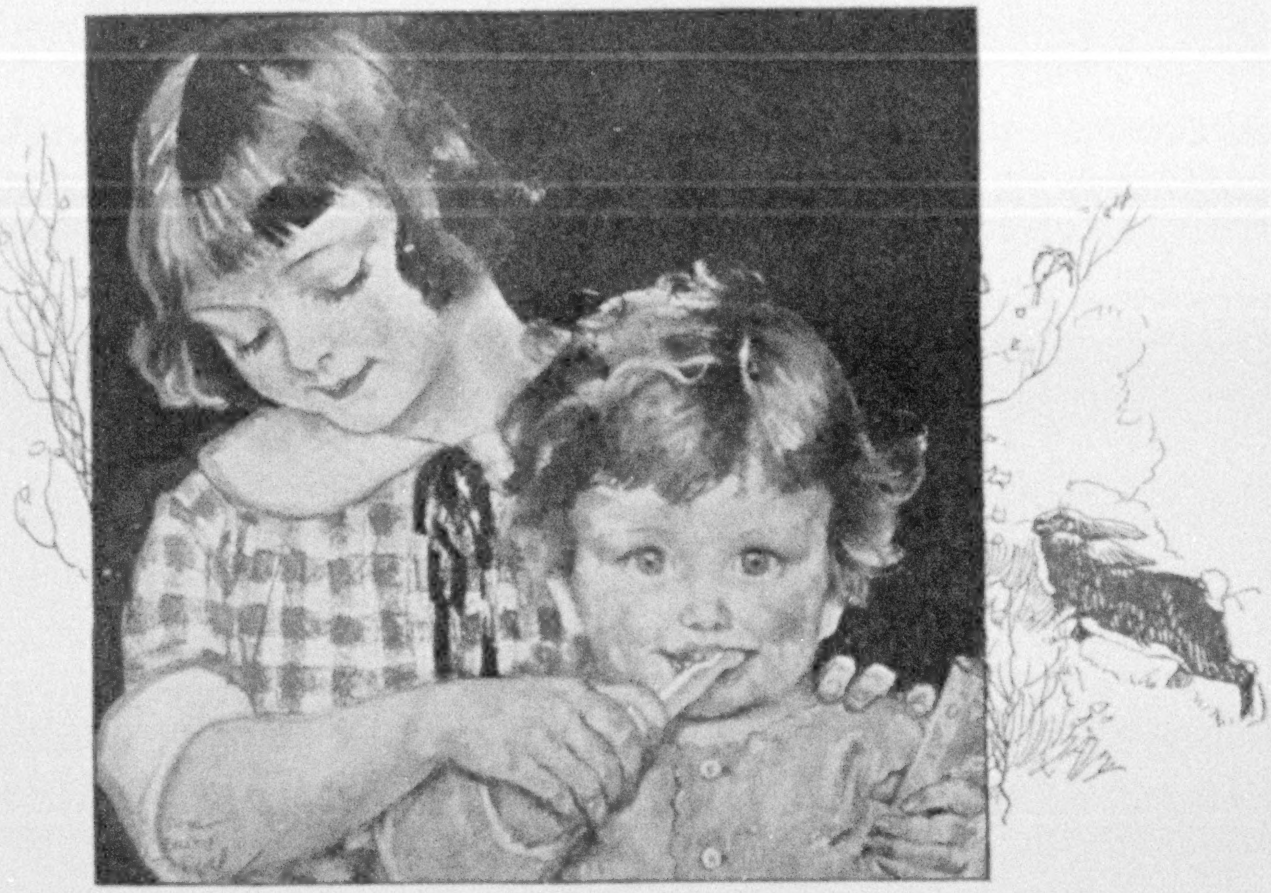

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